OFFICIAL PUBLICATIONS
OF CORNELL UNIVERSITY

VOLUME II NUMBER 16

NEW YORK STATE COLLEGE OF AGRICULTURE ANNOUNCEMENT 1911-12

OCTOBER 1, 1911
PUBLISHED BY CORNELL UNIVERSITY
ITHACA, NEW YORK

CALENDAR

1911–12

First Term

Sept. 15,	Friday,	University entrance examinations begin.
Sept. 25,	Monday,	Academic year begins. Registration of new students. Special students, old and new, must first present themselves at the Office of the Secretary, Main 122, unless permission to register has been sent them by the Registrar.
Sept. 26,	Tuesday,	Registration of new students.
Sept. 27,	Wednesday,	Registration of old students.
Sept. 28,	Thursday,	Instruction begins. President's annual address to the students, 12.00 m.
Oct. 17,	Tuesday,	Last day for payment of tuition.
Nov.	Thursday–Friday,	Thanksgiving recess.
Nov. 28,	Tuesday,	Registration for the Winter Courses, beginning at 8 a. m. at the Office of the Secretary.
Nov. 29,	Wednesday,	Instruction begins in the Winter Courses.
Dec. 20,	Wednesday,	Instruction ends in regular and special work. Christmas recess.
Jan. 3,	Wednesday,	Instruction resumed.
Jan. 11,	Thursday,	Founder's Day. Holiday.
Jan. 27,	Saturday,	Instruction ends for first term.
Jan. 29,	Monday,	Term examinations begin.

Second Term

Feb. 10,	Saturday,	Registration for second term.
Feb. 12,	Monday,	Instruction begins.
Feb. 22,	(week of),	Farmers' Week.
Feb. 23,	Friday,	Instruction ends in the Winter Courses.
Mar. 1,	Friday,	Last day for payment of tuition.
April 3,	Wednesday,	Instruction ends. Spring recess.
April 9,	Tuesday,	Instruction resumed.
May 31,	Friday,	Instruction ends for the second term.
June 1,	Saturday,	Navy Day. Holiday.
June 3,	Monday,	Term examinations begin.
June 20,	Thursday,	Forty-fourth Annual Commencement

Summer School in Agriculture, 1912

July 8,		Summer School begins.
Aug. 16,		Summer School ends.

1912–13

Sept. 13,	Friday,	Entrance examinations begin.
Sept. 23–24,	Monday–Tuesday,	Registration of new students.
Sept. 25,	Wednesday,	Registration of old students.
Sept. 26,	Thursday,	Instruction begins.

NEW YORK STATE COLLEGE OF AGRICULTURE

Faculty

Jacob Gould Schurman, A.M., D.Sc., LL.D., President of the University.
Liberty Hyde Bailey, M.S., LL.D., Director of the College of Agriculture and Dean of the Faculty.
Isaac Phillips Roberts, M. Agr., Professor of Agriculture, Emeritus.
John Henry Comstock, B.S., Professor of Entomology and Invertebrate Zoology.
Henry Hiram Wing, M.S. in Agr., Professor of Animal Husbandry.
John Craig, M.S. in Agr., Professor of Horticulture.
Thomas Lyttleton Lyon, Ph.D., Professor of Soil Technology.
Herbert John Webber, M.A., Ph.D., Professor of Plant Breeding.
John Lemuel Stone, B.Agr., Professor of Farm Practice and Farm Crops.
James Edward Rice, B.S.A., Professor of Poultry Husbandry.
Benjamin Minge Duggar, M.S., Ph.D., Professor of Plant Physiology.
George Walter Cavanaugh, B. S., Professor of Chemistry in its Relations with Agriculture.
George Nieman Lauman, B.S.A., Professor of Rural Economy.
Herbert Hice Whetzel, A.B., M.A., Professor of Plant Pathology.
Elmer O. Fippin, B.S.A., Professor of Soil Technology.
George Frederick Warren, Ph.D., Professor of Farm Management.
William Alonzo Stocking, jr., M.S.A., Professor of Dairy Industry.
Charles Scoon Wilson, A.B., M.S.A., Professor of Pomology.
Charles Henry Tuck, A.B., Professor of Extension Teaching.
Albert Russell Mann, B.S.A., Secretary to the College of Agriculture, Registrar, and Professor of Agricultural Editing.
Wilford Murray Wilson, M.D., Professor of Meteorology.
Walter Mulford, B.S.A., F.E., Professor of Forestry.
James George Needham, Ph.D., Professor of General Biology, Limnology, and Nature Study.
Bryant Fleming, B.S.A., Professor of Rural Art.
Harry Houser Love, Ph.D., Professor of Plant-Breeding Investigations.
Arthur Witter Gilbert, Ph.D., Professor of Plant Breeding.
Donald Reddick, A.B., Ph.D., Professor of Plant Pathology.
——— ———, Professor of Farm Crops.
——— ———, Professor of Rural Education.
Flora Rose, B.S., M.A., Lecturer in Home Economics.
Martha Van Rensselaer, A.B., Lecturer in Home Economics.
William Albert Riley, Ph.D., Assistant Professor of Entomology.
Merritt Wesley Harper, M.S., Assistant Professor of Animal Husbandry.
William Charles Baker, B.S.A., Assistant Professor of Drawing.
James Adrian Bizzell, Ph.D., Assistant Professor of Soil Technology.
Clarence Arthur Rogers, M.S.A., Assistant Professor of Poultry Husbandry.

Glenn Washington Herrick, B.S.A., Assistant Professor of Economic Entomology.
Howard Wait Riley, M.E., Assistant Professor of Farm Mechanics.
Cyrus Richard Crosby, A.B., Assistant Professor of Entomological Investigations.
Harold Ellis Ross, M.S.A., Assistant Professor of Dairy Industry.
Elmer Seth Savage, M.S.A., Ph.D., Assistant Professor of Animal Husbandry.
Lewis Knudson, B.S.A., Ph.D., Assistant Professor of Plant Physiology.
Kenneth Carter Livermore, B.S. in Agr., Assistant Professor of Farm Management.
Alvin Casey Beal, Ph.D., Assistant Professor of Floriculture.
Mortier Franklin Barrus, A.B., Assistant Professor of Plant Pathology.
James Chester Bradley, Ph.D., Assistant Professor of Systematic Entomology.
E. Gorton Davis, B.S., Assistant Professor of Rural Art.
——— ———, Assistant Professor of Soil Technology.
——— ———, Assistant Professor of Dairy Industry.
——— ———, Assistant Professor of Rural Economy.
——— ———, Assistant Professor of Forestry.
Charles Cleveland Hedges, A.B., Instructor in Agricultural Chemistry.
George Walter Tailby, jr., B.S.A., Superintendent of Live Stock.
Lewis Josephus Cross, B.A., Instructor in Agricultural Chemistry.
Edward Sewall Guthrie, M.S. in Agr., Instructor and Investigator in Dairy Industry.
Paul Work, B.S., A.B., Instructor and Investigator in Olericulture.
Ralph Hicks Wheeler, Instructor in Extension Teaching.
Roy David Anthony, B.S. in Agr., Instructor in Pomology.
Lee Briggs Cook, M.S. in Agr., Instructor in Dairy Industry.
Robert Matheson, M.S. in Agr., Ph.D., Instructor in Biology.
George C. Embody, Ph.D., Instructor in Aquiculture.
Morris Mickey McCool, M.S. in Agr., Ph.D., Instructor in Plant Physiology.
Harry M. Fitzpatrick, A.B., Instructor in Plant Pathology.
Harry O. Buckman, M.S.A.. Instructor in Soil Technology.
Arthur Lee Thompson, B.S. in Agr., Instructor in Farm Management.
——— ———, Instructor in Poultry Husbandry.
Byron Burnett Robb, B.S. in Agr., Instructor in Farm Mechanics.
Ray Eugene Deuel, B.S. in Agr., Instructor in Animal Husbandry.

Other Officers of Instruction and Administration

Alice Gertrude McCloskey, A.B., Lecturer in Nature Study.
Anna Botsford Comstock, B.S., Lecturer in Nature Study.
Mrs. Helen Binkerd Young, B.Arch., Instructor in Home Economics.
John Walton Spencer, Agent in Extension Work.
Hugh Charles Troy, B.S.A., Assistant in Dairy Laboratory.
G. Clayton Dutton, Assistant in Cheese Making.
Harvey Lyon Ayres, Superintendent of Dairy Manufactures.
Charles Herbert Van Auken, Assistant in Animal Husbandry.
Ada Eljiva Georgia, Assistant in Nature Study.
Clara Nixon, Assistant in Poultry Husbandry.
Lois Watson Wing, A.M., Assistant in Dairy Industry.

Emmons William Leland, B.S.A., Assistant in Soil Technology.
John Thomas Lloyd, A.B., Assistant in Biology.
Anna Clegg Stryke, A.B., Assistant in Entomology.
Walter Stanley Lyon, Assistant in Poultry Husbandry.
———— ————, Assistant in Poultry Husbandry.
Anna Eliza Jenkins, B.S. in Agr., Assistant in Plant Pathology.
Ralph John Gilmore, A.M., Assistant in Biology.
George Richard Hill, jr., B.S., Assistant in Plant Physiology.
Charles Truman Gregory, B.S. in Agr., Assistant in Plant Pathology.
Louis Merwin Hurd, Assistant in Poultry Husbandry.
Robert Palmer Trask, Assistant in Poultry Husbandry.
Walter Warner Fisk, B.S. in Agr., Assistant in Dairy Industry.
Frank Elmore Rice, A.B., Assistant in Agricultural Chemistry.
——— ———, Assistant in Agricultural Chemistry.
William Robin Thompson, B.S.A., Assistant in Entomology.
Lucy Wright Smith, M.A., Assistant in Entomology.
Thomas Joseph McInerney, B.S. in Agr., Assistant in Dairy Industry.
Horace Mann Pickerill, B.S. in Agr., Assistant in Dairy Industry.
Delmont Westervelt, Mechanic to Department of Farm Mechanics.
John Lindley Doane, A.B., B.S. in Agr., Assistant in Rural Art.
Lucy Harriet Ashton, Assistant Registrar.
——— ———, Superintendent of the Farms.
George Walter Tailby, Foreman of the Farms.
Charles Edward Hunn, Gardener.
George M. Cosh, Gardener to the Horticultural Department.
Arthur Bradford Cornelius, Assistant Gardener.
Walter Garnet Krum, Superintendent of Poultry Plant.
Andrew Jackson Lamoureux, Librarian.
Herbert W. Teeter, Superintendent of Plant-Breeding Garden.
Edwin S. DeLany, Clerk.
Laura McLallen Van Auken, Clerk in Department of Dairy Industry.
Gilbert Arthur Renney, Superintendent of Mailing Rooms.

THE COLLEGE OF AGRICULTURE

By act of the Legislature of the State of New York, approved May 9, 1904, an appropriation of $250,000 was made for buildings for the College of Agriculture; and the act authorized Cornell University to purchase the dairy building erected by the State some years before, and to add the purchasing price ($40,000) to the appropriation, thereby making a building fund of $290,000. The act also established the College as "The New York State College of Agriculture at Cornell University". These buildings were first occupied in June, 1907. They consist of a group of three buildings connected by covered loggias, and a detached building occupied by the Department of Animal Husbandry. The main group, with a frontage to the south of four hundred and eighty-four feet, occupies a site to the east of the original University campus. All the buildings are of brick. The Main Building, central in the group of three, has in the basement mailing and storage rooms for the publications of the College, the office of The Cornell Countryman, an extension office, a large lavatory with baths and lockers, and laboratories and store-rooms for horticulture and other work. The heating plant for the building is beneath this basement. A completely inclosed passageway leads to the basement of the Dairy Building on the east and to the Agronomy Building on the west.

The first floor of the Main Building contains the offices of administration, including the offices of the Director and of the Secretary, and the business office, to the west of the main entrance. To the east are the office for extension teaching, the library, seminary room, and the office of the Department of Rural Economy. Between these two groups of rooms is the auditorium, seating about six hundred. The loggias on this floor are open at the sides, but covered above.

The second floor is occupied by the Departments of Horticulture and Pomology, with lecture rooms, two laboratories, and offices for the staff. Here is also provided a women's rest room and lavatory.

The Department of Entomology and General Invertebrate Zoology occupies the third floor, which includes the museum and the offices of the staff. The laboratories are especially well lighted. The lecture room will accommodate one hundred and sixty. Quarters are provided for the work in limnology.

In the center of the fourth floor is a suite of rooms occupied by the Central Station, New York Section, of the Weather Bureau of the United States Department of Agriculture. To the west are nature study and home economics offices, and to the east the laboratories of the Department of Home Economics.

The Dairy Building, to the east of the Main Building and connected with it by passageways on three floors, is in two sections. The three-story part has, in the basement, locker rooms and lavatory with bath, rooms for instruction and practice in dairy mechanics, and a steam laundry; on the main floor, the general offices of the Department of Dairy Industry, large laboratories for dairy bacteriology with the necessary incubator room, and a special reading room, which also serves in part as a museum; on the second floor, the large lecture room seating two hundred and fifty, with its preparation room, and a smaller lecture room. The large milk-testing laboratory is also provided with a preparation room. In the attic is given the instruction in drawing required in the various courses in the College. Connected with this three-story part is the section containing the manu-

facturing rooms. The milk-receiving room adjoins the separator room and the cheese-making room as well as a can-cleaning room. Between the separator room and the churn room are the cream-ripening room and the refrigerator for butter. Beyond the cheese-making room is a series of three curing rooms, the starter room, and a room for farm dairy practice. Adjoining the main Dairy Building are the rooms for handling market milk, including a receiving room, bottling room, sterilizing and refrigerating rooms, and a bottle washroom; and below these in the basement are large storage and refrigerator rooms. On the same side as the rooms for cheese making and in the basement, are the rooms for making fancy cheese, with additional curing rooms and a room for casein making. A boiler-and-engine-room, with the necessary storage, complete the general features of the Dairy Building.

To the west of the Main Building and connected with it, like the Dairy Building, by passageways on three floors, is the Agronomy Building. The basement is used for instruction in farm mechanics and in soil technology. The first floor contains a number of offices and the laboratory for plant physiology; on the second floor is the large laboratory for the study of farm crops. The Experiment Station also has on this floor a large laboratory for the study of problems in fertility. On the top floor are the Departments of Plant Pathology and Plant Breeding.

To the northeast of the main buildings is the separate building for the Department of Animal Husbandry, with its large judging pavilion, offices, library, and lecture and laboratory rooms.

To the west of the Agronomy Building is a modern rural school house, in which the work in rural education is conducted. To the northeast of the Animal Husbandry Building lie the school gardens.

In the rear of the Main Building is the University barn and the poultry houses. The new barns provided by act of the Legislature are on the farms to the eastward.

The new glass houses are just east of the agricultural group.

The farms and experimental plats, comprising about six hundred and thirty-eight acres, are adjacent.

The Agricultural Experiment Station is a department of the New York State College of Agriculture. Students may get incidental instruction from observing and discussing the experiments that are being conducted.

The publications of the Agricultural Experiment Station include to date twenty-three annual reports and three hundred and two bulletins. Such of these publications as are available are, as far as the means of the Station will permit, distributed free to residents of the State who apply for them.

EQUIPMENT OF THE DEPARTMENTS

Agricultural Chemistry

The instruction in agricultural chemistry is given in Morse Hall. Here ample facilities are provided for laboratory work, which is made an important part of the instruction. The laboratories are well lighted and provided with gas, electric light, distilled water, and compressed air. Each student is provided with complete apparatus for quantitative analysis. The work is arranged to familiarize the

student with the composition and properties of the more important agricultural chemicals.

For the advanced courses there is a special laboratory accommodating twenty-four students.

The lecture rooms are provided with electric projection lanterns for illustrating the lectures, and have large well equipped lecture tables. There are also a chemical museum and reading room.

Animal Husbandry

The equipment in animal husbandry available for purposes of instruction is as follows:

1. **The College Herds and Flocks.** A herd of about one hundred and twenty-five head of cattle is maintained. Aside from a carload of steers fed for market each year, it is essentially a dairy herd, to a large extent bred and developed by the College itself. It at present contains representative specimens of Holsteins, Jerseys, Guernseys, Ayershires, and Shorthorns.

The college maintains an imported Percheron stallion and a pure bred Hackney stallion. Four pure bred Percheron mares are used primarily for breeding purposes. The farm teams illustrate grade draft horses of several types.

A flock of about seventy-five sheep includes representative specimens of Dorsets, Shropshires, Hampshires, Southdowns, Delaines, Rambouillets, and Cheviots, and is kept mainly for the production of winter or hothouse lambs. About ten brood sows of the Cheshire breed—"the New York Farmer's Hog"—are kept to utilize waste dairy products and to illustrate a profitable early maturing butchers' hog of a semi-bacon type.

2. **Herd Books and Flock Books.** The library of herd books and flock books is large, comprising more than 1,000 volumes and including complete sets dealing with all the more important breeds and with many of the lesser ones.

A fairly complete collection of lantern slides, illustrating breed types, and skeletons of the horse and the ox, add to the material available for class room purposes.

The Animal Husbandry Building, detached from the main group, but adjacent, is sixty by ninety feet in size.

Dairy Industry

The Department of Dairy Industry occupies the building east of the main agricultural building. A covered loggia connects the two. The class rooms, bacteriological and testing laboratories, locker rooms, reading room, offices, and dairy mechanics rooms occupy a part of the building, fifty by one hundred feet in size and three stories high. All manufacturing work is conducted in the remaining part of the building, sixty by one hundred and sixty feet in size and one story high. The manufacturing rooms are thoroughly sanitary, fully equipped, and well adapted for instruction and for commercial work. In the winter about 15,000 pounds of milk are handled daily, and in the summer the milk received at the Dairy Building and the cream received from three skimming stations represent about 30,000 pounds of milk daily. The skimming stations are located at short

distances north of Ithaca and are equipped and conducted like stations operated exclusively for commercial purposes.

Instruction is given by lectures and recitations, supplemented by practice in laboratories and manufacturing rooms. The practice is of seven kinds.

1. **Testing Milk and Milk Products for their Richness and Purity.** The testing laboratory is equipped with two hundred lockers for students, the leading styles of turbine and hand centrifugal Babcock testers, one Russian Babcock tester, one Gerber tester, casein testers, moisture and acid testing apparatus, lactometers, and all necessary glassware.

2. **Dairy Bacteriology.** This division is provided with two large and well lighted laboratories, individual desks and lockers for students, full equipment for making media, hot air and steam sterilizers, incubators for maintaining constant temperatures, high-speed centrifuges for determining dirt and bacterial content of milk, high-power microscopes, and all glassware necessary for bacteriological work.

3. **Butter Making.** This work is conducted in several separate rooms. The farm dairy room contains leading kinds of hand-power separators and churns, and various apparatus used in a dairy where butter is made in small quantities. Creamery methods are taught chiefly in a large separator room, provided with several types of power separators, milk heaters, and pasteurizers, and in a churning room provided with different kinds of power churns and workers. There are special rooms for making starters, for ripening cream, and for holding butter in cold storage. There is also a boiler room with thirty horsepower boiler, engine, and necessary pumps.

4. **Cheddar-Cheese Making.** The room for this work is equipped with one large vat and eight smaller vats, one horizontal continuous pressure press, one upright press, hoops for making cheese in four sizes, rennet tests, acid tests, curd mills, and other small apparatus. Four insulated curing rooms adjoin the manufacturing room.

The milk-receiving room and the can-washing room are convenient to the creamery and cheese rooms. These are provided with scales, composite sample outfit, and a power can washer and rinser.

5. **Fancy-Cheese Making.** Making rooms and curing rooms with necessary equipment are provided for the manufacture of a few varieties of so-called fancy cheese. The varieties will be increased in number as rapidly as possible.

6. **Market-Milk Handling.** For this work there are four rooms, including a special refrigerator sterilizer and a receiving room. In their arrangement, the principles governing the proper management of any commercial sanitary milk plant have been considered. The equipment includes a rotary washer, a rinser, a cooler, and approved bottle-filling apparatus. The college operates a market-milk route for the disposal of milk produced by the college herd, and all records are kept in the same manner as in any commercial dairy.

7. **Dairy Mechanics.** This instruction is given in the Department of Farm Mechanics in the basement of the Agronomy Building. The equipment includes steam engines, gasoline engines, shafting, various sizes of pulleys, belts, different types of separators, and tools for pipe fitting, soldering, and plain carpenter work, a number of tools somewhat larger than would be found in many well conducted dairy manufacturing plants.

A deposit is required to cover the value of apparatus loaned to students. When the apparatus is returned in good order, the deposit is returned, less a charge of twenty-five cents to apply on losses of general equipment. Clean, white overall suits are required for all practice work in this department. These suits may be purchased by the student, or rented from the department at fifty cents per term. Lockers for these suits as well as for equipment used by individual students in the laboratories, are provided without charge.

Entomology

The entomological laboratories are well equipped for all phases of entomological study. There is a good supply of microscopes and accessories, including equipment for photo-micrographic work. In addition, there is a very full oufit for insect photography. Ample facilities, such as microtomes, paraffin ovens, and reagents, are provided for work in insect morphology and embryology, and an extensive collection of prepared slides is at the disposal of students.

The insect collections, developed as an adjunct to the work of instruction, are especially rich in biological and illustrative material. In addition to many exotic species, they contain specimens of a large number of the more common species of the United States. These have been determined by specialists and are accessible for comparison.

The lecture room is provided with a synoptic collection of insects, sets of the Leuckart and the Pfurtscheller diagrams, models, projection lanterns, and complete means for the projection of microscopic objects.

Adjacent to the laboratories is an insectary, which, together with the insectary of the Agricultural Experiment Station, affords to advanced students exceptional opportunities for special investigation in life histories, and for experiments in applied entomology.

For study of the life histories, biology, and economic importance of aquatic forms, unrivalled facilities are afforded by the field laboratory, located in the midst of the Renwick marshes and fully provided with breeding cages, running water, and aquaria.

Farm Management

Farms adjacent to Ithaca furnish laboratory materials for the study of farm management. Ithaca is specially well situated for the study of farm management, because there is a great diversity of conditions. Some of the best and some of the poorest farms of the state are within easy reach of Ithaca. Excursions are also made to a few farms in other parts of the state for the study of field crops and farm management. The results of the agricultural survey are useful in this study.

Farm Mechanics

This department is housed in the north end of the basement of the Agronomy Building. The equipment includes a traction engine, a small steam engine, seven gasoline engines, several pumps, hydraulic rams, a windmill, threshing machine complete with all modern improvements, four binder attachments, plows, harrows, cultivators, planters, harvesters, and a large number of other agricultural imple-

ments which, because of their bulk, are stored in the barns of the College. Among a number of implements and models of historic value are the copies of the Rau plow models secured by ex-President A. D. White in Germany in 1868. A number of pieces of special apparatus have been designed and constructed as required, of which the most important is a "sprayograph" for testing spray nozzles.

The department also owns equipment for instruction in farm engineering.

Farm Practice and Farm Crops

Instruction in farm crops is given by means of lectures, recitations, and field and indoor laboratory work. The department is provided with a lecture room and a large, well lighted laboratory, equipped with specially designed desks for ninety-two students, with gas and water and ample locker space. Farm crop materials are procured for use in indoor laboratory work. Bulletins of the various experiment stations constitute a part of the laboratory equipment. The farms and experimental plots are used for laboratory work in the field.

Home Economics

In recognition of a growing need for scientific instruction in the subjects most closely related to the welfare of the home and the family, a Department of Home Economics was established in the College of Agriculture in the fall of 1907. The quarters of this department are on the fourth floor of the Main Building of the College. They comprise the following rooms. 1. A laboratory equipped to accommodate twenty students. This equipment is modern and includes a collection of the recent appliances useful in simplifying household processes, such as fireless cookers, bread and cake mixers, and alcohol appliances of various kinds. 2. A small dining-room and a kitchen planned to illustrate the lessened effort made possible in a condensed area where there is a convenient arrangement of all apparatus. 3. A small household laundry with both hand and power equipment. 4. A class-room. 5. Departmental offices. The department has a good library, a collection of slides, and various illustrative materials needed in lectures.

Horticulture

The equipment is divided into two parts,—that belonging to the class rooms and laboratories on the second and basement floors of the main agricultural building, and that connected with the forcing houses and the grounds surrounding them and farther afield. The equipment is shared with the Department of Pomology.

1. **Class Rooms and Laboratories.** Lectures and a major part of the laboratory work are given in the headquarters of the department, on the second floor of the Main Building. On this floor are lecture rooms, laboratories, and offices.

The larger lecture room is provided with a stereopticon, and has a seating capacity of one hundred and twenty; the smaller seats thirty-five, besides accommodating the herbarium. One laboratory is devoted to practical and systematic pomology, floriculture, and olericulture, and is equipped in the most approved manner for the practical and laboratory phases of horticultural and pomological work. It accommodates forty students. The other laboratory is for advanced students, where those who are working in the Graduate School or are engaged in research are provided with suitable appliances for their special needs. Space is

here afforded for twenty students. The remainder of the floor is used as a museum and for offices for the instructing staff. Large display cases lining the corridor are filled with horticultural specimens, tools, and appliances.

In the basement is a laboratory for practical work in nursery problems and elementary pomology. The capacity of this laboratory is fifty students, so that a beginning class of one hundred may be accommodated in two sections.

2. **Forcing Houses and Orchards.** New glass structures for the study of forcing crops, such as flowers, vegetables, and fruits, covering an area of about 7,000 square feet, were recently completed and are used in connection with nearly all classes, more especially by those in floriculture and olericulture. One house is assigned to advanced students for the working out of special problems, and another is given over to the study of the variation of plants and the technique of plant breeding.

The land equipment comprises the vegetable gardens near the campus, which furnish excellent demonstration material for lecture and laboratory.

Aside from ordinary equipment, the garden herbarium, with more than 12,000 sheets, is an important aid in the study of systematic pomology and plant variation. There is also an exceptionally fine collection of nearly 10,000 negatives illustrating all phases of the growing of fruits, flowers, and vegetables. This collection is being added to continually, and furnishes a useful source for lantern slides to illustrate recent methods in the management of fruit plantations, the construction of forcing houses, and the growing of vegetables and flowers in field and under glass. The department has a collection of 2,000 lantern slides, to which additions are constantly being made.

Plant Breeding

This department was organized in 1907, primarily for the experimental study of evolution. Its laboratory and offices are on the top floor of the Agronomy Building.

The demand for instruction in plant breeding by students in the College became so great that a teaching division was established in 1908. This division has charge of undergraduate instruction and directs graduate investigation. Graduate students engaged in research are closely associated with the experimental division and are allowed the advantages of its equipment. This equipment, including laboratory, greenhouses, and gardens, is designed primarily for investigation in experimental evolution.

The equipment of the teaching division is separate from that of the experimental division, except the plant breeding library and a small part of the plant breeding garden. It is designed to aid students in their study of variation, hybridization, and practical breeding. The teaching division has no class room or laboratory of its own, but adequate rooms are provided for its use.

The experimental laboratory is well supplied with suitable microscopes, microtomes, paraffin ovens, etc., for use in histological investigations. It has also a full photographic outfit and calculating machines for the statistical study of variations. An excellent library, dealing with plant breeding and experimental evolution, and an extensive card catalogue of plant breeding literature, form a part of the equipment. The private libraries of members of the staff, containing many valuable books and pamphlets, are placed at the disposal of graduate students.

An herbarium of variations of plants is in process of formation. For conducting investigations during the winter, graduate students have the use of three greenhouses, which have a total floor space of 2,000 square feet. These houses are provided with all necessary appliances for plant culture. For growing hybrids and other plants during the summer a garden of three acres is available. For more extensive plantings the department has the use of parts of the University farms.

Plant Pathology

The Department of Plant Pathology, organized in 1907, is housed in the south end of the top floor of the Agronomy Building. The equipment consists of a large elementary laboratory, an advanced laboratory, work room, culture room, and offices, including small research rooms for graduate and advanced students. This equipment, which is new throughout, includes furniture especially built for the work of the department, a complete set of microscopes, microtomes, sterilizers, electric incubators, etc., for teaching and investigation. There are also a rapidly growing pathological herbarium, numerous photographs, a department library, etc. Land and greenhouses are available for demonstration and experimental work as well as for teaching. The department is now in a position to offer facilities for practically every kind of work within its field.

Plant Physiology

The Department of Plant Physiology is well equipped for instruction and research. The laboratory facilities include microscopes, microtomes, incubators, ovens, sterilizers, and other special physiological and bacteriological apparatus; precision instruments for the measurement of environmental conditions; chemical tables, titration stands, nitrogen still, balances, glassware, and other materials required in that part of the work dealing with biochemistry and fermentation.

The instruction is arranged with reference not merely to persons who are interested in various phases of plant industry, but also to those who may be preparing themselves as teachers, or as investigators in related lines. Special opportunities are offered to those properly trained in physiology, horticulture, and agronomy, to undertake fundamental investigations in the general field of plant response and behavior.

With the increased space which it is expected will be available in 1911–12, it is planned to differentiate sharply between the laboratories devoted, on the one hand, primarily to undergraduate instruction, and those utilized, on the other hand, for graduate work and research. The new greenhouses offer opportunities for class work and for individual investigation. Moreover, the University farms and grounds will supply for those who may devote the growing season to their investigations, a variety of crops and ornamental plants needed for particular observation and experiment.

Pomology

The Department of Pomology, organized in 1910, is well equipped for instruction. The class room and laboratory are on the second floor of the Main Building. There is also a fifty acre field laboratory devoted to commercial and varietal orchards of the different fruits. Most of the plantings are young and offer excel-

lent opportunities for practical work and demonstrations. On the grounds are also orchards of Paradise and Doucin stock, and a large collection of seedlings used for propagation.

The collection of spray machinery, including gas engines, traction outfits, and the like, is nearly complete, permitting thorough instruction in the practical methods of controlling orchard enemies.

Exceptional facilities are available for studying fruit varieties and packing. Each year a large assortment of fruit, which is used for purposes of instruction, is brought together at the College. The department is equipped with a large number of new packing tables and presses.

The aim of the instruction is to train students for practical work, for experimental work, and for teaching. The courses cover in detail the preparation for all of these fields.

Poultry Husbandry

The Department of Poultry Husbandry is located north of the new Agricultural College buildings. The area occupied is almost four acres. About one mile distant is the poultry farm, a tract of some fifty acres. The buildings consist of a main building thirty by forty-six feet, and houses providing seventy pens for about fifteen hundred fowls. These houses include twenty-four New York State gasoline-heated colony brooder-houses and summer houses for rearing thirty-five hundred or more chickens annually, and a new laying house two hundred and seventy-six feet long containing twenty-three pens. The main building contains an incubator cellar thirty by thirty feet, an egg room, killing room, carpenter shop, lockers for fifty students, and a dormitory and laboratory.

The lectures and recitations and the laboratory, seminary, reading, and drawing courses are all given in the Dairy Building. In this building also are located the department office and reading room.

Instruction is divided about equally between lectures, recitations, text-book study and required reading, and the practice courses.

1. **Lectures.** For the lecture courses there are a large number of charts and models, about eight hundred and five lantern slides, and two thousand two hundred and eighty-one negatives with blue prints.

2. **Systematic Reading.** Students have easy access to the library and reading room of the Agricultural College and Experiment Station. In addition to this there are the poultry alcove in the University Library and the poultry reading-room (in the Dairy Building), where the principal poultry books are kept and where fifty-four poultry papers are on file. There is also a large card index of poultry literature.

3. **Laboratory, Shop, Plant, and Field Practice.** These four kinds of practice are given in the afternoons to supplement the lectures and recitations. For the shop work there is a good collection of carpenter's tools.

For the laboratory and field practice, there are available several sets of caponizing instruments of different makes, anatomical and drawing instruments, model of a turkey and of an egg during incubation, a collection of eggs of nearly all the varieties of poultry, twenty-five enlargements of various varieties of poultry from the American Standard of Perfection, microscopes, camera, balances and scales, models of poultry buildings and trap nests, killing instruments, a collection

of packages for marketing poultry products, and samples of forty kinds of poultry feeds.

4. **Feeding and Management.** For this course twenty-eight pens, containing from fifteen to thirty each of ten leading varieties of fowls and four varieties of ducks, are used. There is a fattening house, twelve by thirty feet, fitted with suitable appliances. Record sheets are supplied by which the student shows at the end of the course a complete history of the method of feeding and care, value of products, profit and loss, etc. Fattening crates and three styles of cramming machines are provided; also five makes of bone cutters, including a large power cutter, a six horsepower gasoline engine, a power feed mill, a clover cutter, and a root slicer.

5. **Incubator Practice.** For the course in incubator practice there are thirty incubators, including several of each of the leading kinds and one or more of a large number of makes sent to the College for inspection and use. The incubator cellar is provided with electric lights for reading the thermometers and testing the eggs. Record sheets show the method of operation of the machine each day. There are hygrometers and thermographs for recording moisture and temperature.

6. **Brooder Practice.** A pipe-system brooder-house, forty-five feet long by twelve feet wide, and five types of brooders, including the gasoline-heated colony brooders and a gasoline storage tank, are used.

Soil Technology

The courses in soil technology are designed to give the student in general agriculture an understanding of the fundamental principles of the management of soils for producing crops and to afford opportunity for special study in particularly important aspects of the subject. The former group includes a study of the processes of soil formation and classification, the physical and chemical properties, and the modification of the soil by cultural operations. It is a summary of the general knowledge of soils. In the latter group, particular phases of the subject are taken up for advanced study, as detailed in the courses of instruction.

The lectures are illustrated by lantern slides and demonstrations. The laboratory is equipped to accommodate two hundred twenty-four students. The equipment includes the most modern apparatus for the study of the physical constitution of the soil, its capacity for the retention and movement of water, for the circulation of air, relation to heat, amount and effects of organic matter, and other important physical and chemical properties. Each student has the use of desks and lockers containing a stock equipment, and of balances, microscopes, thermometers, mechanical analysis outfits, aspirators, and so on.

Large quantities of typical samples of soil are provided for study, and in addition there is a large collection of samples of important type soils from all parts of the United States for examination and comparison. The study of the soils of the United States is supplemented by detailed soil maps of all areas surveyed to date.

The great variety of soils and soil conditions in the vicinity of Ithaca is made use of for field excursions to study their classification, occurrence, and treatment. All necessary equipment for the preparation of farm soil maps is provided. A large collection of soil-working implements is available for study with reference to

their construction for efficiency of operation in soils of different character and condition.

For special advanced study and investigation special apparatus and facilities are available, according to the subject.

EXPENSES, FELLOWSHIPS, SCHOLARSHIPS, AND PRIZES

Tuition in the College of Agriculture is free to both graduate and undergraduate students who for a year or more immediately preceding admission have been residents of the State of New York. The annual tuition fee of regular students from outside the State is $100, and of special students from outside the State, $125.

The tuition for regular students is payable in two instalments, $55 at the beginning of the first term and $45 at the beginning of the second term; the tuition for special students is payable similarly in instalments of $70 and $55. A limited number of free scholarships for the year 1911–12 have been established in the College of Agriculture for students from outside the State of New York. Other fees, required of all students, are as follows:

Matriculation fee	$5.00
Infirmary fee, each term of 1911-12	2.00
Fee for baccalaureate degree	10.00

Deposit fees are required in various laboratory courses; about these inquiry should be made before registration. Students are liable to a special charge for breakage or damage resulting from their own carelessness. Attention is called to the expenses of excursions required in various courses.

The expense of text books, instruments, etc., varies from $10 to $75 per annum.

The cost of living in Ithaca, including board, room, heat, and lights, varies from $5.50 to $10 a week.

The cost of board, rent of furnished room, fuel, and lights, in Sage College or Sage Cottage, which are exculsively for women, varies from $225 to $300 per year. Both buildings are warmed by steam and lighted by electricity; and in most cases, the sleeping apartment is separated from the study. The responsibility for the conduct of the students living in Sage College and the Cottage rests with the Adviser of Women in the University. Inquiry regarding board and rooms at the Sage College and the Cottage should be addressed to the Business Manager of Sage College, Ithaca, N. Y.

Scholarships and Fellowships in Agriculture

For Regular and Special Students

The Roberts scholarship fund, a gift of the late Dr. Charles H. Roberts of Oakes, Ulster County, N. Y., provides five scholarships each tenable for one year. As expressed by the founder, the purpose of these scholarships is to furnish financial assistance to students in the College of Agriculture who are of good moral character, who show native ability, tact, and application, and who are in need of such assistance, especially students who come from rural districts. The award is made after the end of the first term of each year. Application blanks and copies of the regulations may be had at the office of the Secretary to the College of Agri-

culture. All applications must be on the official blanks, which, with all other information, must be filed with the Secretary before February 1, 1912. The value of each scholarship is $240.

A few free scholarships for the year 1911–12 are open to non-residents of New York State.

A graduate fellowship of the value of $500 is annually awarded in Agriculture and Veterinary Science.

A number of industrial fellowships are established for a limited period, usually two years, by growers, companies, etc., who wish to cooperate with the College of Agriculture in the solution of agricultural problems. These fellowships are given to men who from their training and experience are deemed competent to undertake the work.

For Winter Course Students

At its annual meeting, held February, 1911, the New York State Grange adopted a resolution whereby $600 is to be given to members of the order in the form of twelve scholarships in the winter courses in agriculture at Cornell University. The scholarships are each of a value of $50, to be awarded to men or women who attain the highest standing in competitive examination. The candidate should apply to the Master of the Pomona Grange in his home county, or to the Deputy in counties that have no Pomona.

Mr. H. L. Beatty has offered, for the year 1911–12, a similar scholarship of a value of $75, "open to any farmer who resides in Bainbridge, N.Y., or to any boy over 16, who shall have attended the Bainbridge High School for one full term".

The Eastman Prize for Public Speaking

With the object of developing qualities of personal leadership in rural affairs, Mr. A. R. Eastman of Waterville, N. Y., has established an annual prize of one hundred dollars for public speaking on country subjects in the College of Agriculture. This prize is designated as the Eastman Prize for Public Speaking. Competition is open to any regular or special student. The contest will take place in February.

GENERAL INFORMATION ABOUT COURSES

The regular instruction in the College of Agriculture constitutes a four-year course leading to the degree of Bachelor of Science in Agriculture. There is a combined course with the State Veterinary College comprising six years and leading to two baccalaureate degrees (page 21). Aside from this there are winter courses, not leading to credits in the University, and opportunities for students to pursue special work. A circular describing the winter courses may be had on application to the Secretary.

Students may pursue agricultural subjects in the Graduate School of the University (degrees M. S. in Agr. and Ph. D.).

The Regular Four-Year Course

Candidates for admission to the regular or four-year course must be at least sixteen years of age, or, if women, seventeen. They must have certificates of good

moral character, and students from other colleges or universities are required to furnish from those institutions certificates of honorable dismissal. Students are admitted on examination, or on presenting credentials of the Education Department of the State of New York, or on acceptable school certificates.

Prospective students who have not lived on farms or had considerable practical experience in agriculture, are urged to spend at least one year on a well managed farm to familiarize themselves with common farm affairs and operations before entering the College.

Candidates for admission must file their credentials and obtain permits for examination at the University Registrar's office, Morrill 10. The results of examination may be ascertained from the Registrar.

Entrance Requirements of Four-Year Course

The subjects that may be offered for admission are named in the following list; the figure in parenthesis following each subject indicates its value in units and shows the maximum and minimum amount of credit allowed in the subject. A unit represents five recitations a week for one year in a study.

1a. English A	(2)	8a. Ancient History	(½–1)
1b. English B	(1)	8b. Modern History	(½–1)
2a. First Year Greek	(1)	8c. Am. History, Civics	(½–1)
2b. Second Year Greek	(1)	8d. English History	(½–1)
2c. Third Year Greek	(1)	9a. Elementary Algebra	(1)
3a. First Year Latin	(1)	9b. Intermed. Algebra	(½)
3b. Second Year Latin	(1)	9c. Advanced Algebra	(½)
3c. Third Year Latin	(1)	9d. Plane Geometry	(1)
3d. Fourth Year Latin	(1)	9e. Solid Geometry	(½)
4a. First Year German	(1)	9f. Plane Trigonometry	(½)
4b. Second Year German	(1)	9g. Spher. Trigonometry	(½)
4c. Third Year German	(1)	10. Physics	(1)
5a. First Year French	(1)	11. Chemistry	(1)
5b. Second Year French	(1)	12. Physical Geography	(1)
5c. Third Year French	(1)	13. Biology*	(1)
6a. First Year Spanish	(1)	14. Botany*	(½–1)
6b. Second Year Spanish	(1)	15. Zoology*	(½–1)
6c. Third Year Spanish	(1)	16. Agriculture	(½–1)
7a. First Year Italian	(1)	17. Drawing	(½–1)
7b. Second Year Italian	(1)	18. Manual Training	(1)
7c. Third Year Italian	(1)		

For admission to the New York State College of Agriculture, an applicant must offer either A or B as below:

A. Fifteen units arranged as follows: English (3), History (1), Elementary Algebra A (1), Plane Geometry (1), French (3) or German (3), elective (6).

B. The Arts College Entrance Diploma or the Science College Entrance Diploma issued by the Education Department of the State of New York.

*If an applicant has counted Biology (1) he may not also offer Botany (½) or Zoology (½).

Other Details of Admission

For other details as to subjects and methods of admission, see the General Circular of Information, which may be had on application to the Registrar, Cornell University, Ithaca, N. Y.

For admission to the freshman class and to advanced standing from other colleges and universities, all communications should be addressed to the Registrar. See the General Circular of Information.

For admission as a special student, communications should be addressed to the Secretary, College of Agriculture, and attention is called to the paragraphs on page 22 of the General Circular of Information.

For admission to graduate work and candidacy for advanced degrees, communications should be addressed to the Dean of the Graduate School.

Requirements for the Degree of Bachelor of Science in Agriculture

The requirements for the degree of Bachelor of Science in Agriculture shall be residence for eight terms, and, in addition to the prescribed work in the departments of Physical Culture and of Military Science and Tactics, the completion of one hundred and twenty hours of required and elective work as outlined on pages 20 and 21.

Credit towards a degree for work done in a preparatory school upon subjects which may be offered for entrance to the University will be given to those students only who, in addition to satisfying all entrance requirements, pass separate examinations in the subjects for which they seek college credit. These examinations will cover substantially the same ground as the University courses in the subjects. An applicant desiring a college credit examination of this kind must apply to the Registrar as early as possible, and in no case later than September 11, 1911, specifying which fifteen units he intends to offer in satisfaction of the entrance requirements, and upon what other entrance subjects he wishes to be examined for credit.

In case he fails to satisfy the entrance requirements in any one or more of the units upon which he has proposed to enter, but passes the credit examination in any other subject or subjects, he may use the latter towards satisfying entrance requirements, but in that case he cannot also receive college credit for it. The college credit examinations will be held in September, on the dates set for the entrance examinations in the same subjects.

A student who receives at entrance twelve or more hours of entrance credit in addition to the requirements for admission, may be regarded as having satisfied one term of residence. Under no circumstances shall surplus entrance credit be accepted as the equivalent of more than one term.

A student who has satisfied the entrance requirements of this College, and has afterwards completed in two or more summer sessions in Cornell University at least twelve hours of work in courses approved by the departments concerned may be regarded as having thus satisfied one term of residence. Under no circumstances shall work done in summer sessions be accepted as the equivalent of more than one term of residence or be counted for more than twelve hours towards graduation.

A student admitted to the College of Agriculture from another College in Cornell University or from any other institution of collegiate rank, will be regarded as having completed the number of terms and hours to which his records entitle him, and will receive all the privileges of students who have completed the same number of terms and hours by residence in the College. In order, however, to secure the degree of Bachelor of Science in Agriculture, he must have completed the prescribed subjects in the four-year course, and two-thirds of his elective work must have been taken in courses allowed as agricultural electives. He must also have been in residence in the College of Agriculture at least two consecutive terms and have completed not less than fifteen hours a term, of which two-thirds, at least, must be subjects taught by the staff of the College of Agriculture.

A student must register for at least 12 hours each term and no new student may register for more than 18 hours. Maximum registration by old students is determined on the basis of record.

All men students who do not specialize to the extent of fifteen hours in entomology, plant breeding, plant physiology, rural art, or home economics, must pass before graduation the examination of the Department of Farm Practice.

At least two-thirds of the entire elective work of each year must be chosen from the agricultural subjects described on the following pages.

The Course Leading to the Degree of Bachelor of Science in Agriculture*

Freshman year	No. of course	Hours 1st term	Hours 2d term
English	1	4	4
Botany	1	3	1
Botany	2	–	2
Chemistry	1	6	–
Chemistry	85 or 6	–	4 or 5
Biology	1	3	3
Electives		0–2	1–4
Total		16–18	15–18

Sophomore year	No. of course	Hours 1st term	Hours 2d term
Geology†	1	3	3
Chemistry‡	85, 85a	–	6
Physics	1	4	–
Physics	5	2	–
Physics	10	–	2
Physiology,§ one of the following:			
Physiology of domestic animals	12	–	3
Human physiology	3	3	–
Plant physiology	7 or 8	4	–
Electives		2–9	1–13
Total		15–18	15–18

*The required courses given in other colleges than Agriculture are announced on pages 55-57.
†Optional for students taking a major in home economics.
‡Required of students taking Chemistry 6 in the freshman year. The laboratory work, 85a, may be taken during the first term, leaving the four-hour lecture course for the second term. Students who do not take Chemistry 6 may not take 85a.
§May be taken in junior or senior year by special permission.

In addition to the above, the required work in military drill and physical training must be taken.

Political Science 51 may be taken during this year.

Junior year	No. of course	Hours 1st term	Hours 2d term
Political Science	51	5	5*

*Repeated second term.

The remainder of the work is made up of electives, at least two-thirds of which must be taken in the College of Agriculture under the following restrictions:

In selecting the subjects in the major group, the student must obtain the advice and approval of some one professor or assistant professor having charge of a subject within the group, who shall be chosen by the student at the beginning of the sophomore year.

All students except those registered in rural art must have passed before graduation at least fifteen hours of agricultural electives in one of the groups named below, and at least three hours in each of the others:

Group A.—Farm Crops
Farm Management
Horticulture
Pomology
Home Economics
Farm Mechanics

Group B.—Animal Husbandry
Poultry Husbandry
Dairy Industry

Group C.—Agricultural Chemistry
Soil Technology
Plant Physiology
Plant Breeding

Group D.—Plant Pathology
Entomology
Limnology
Rural Economy

Combined Course in Agriculture and Veterinary Medicine

A regular student who has satisfactorily completed all the required work of his course and who has a credit of at least ninety hours may, with the permission of the faculties concerned, be registered both in the College of Agriculture and in the New York State Veterinary College and, on the completion of thirty hours, of which not less than twelve hours shall be taught in the New York State College of Agriculture, may be recommended for his degree. On the completion of the remaining two years and meeting the requirements of the State Veterinary College he will then receive the degree of D. V. M.

DEPARTMENTS OF INSTRUCTION

With Outlines of Courses That May Be Chosen by Regular or Special Students as Agricultural Electives

Subject to the restrictions already mentioned (pages 19–21), at least two-thirds of the elective work must be chosen from the courses described on the following pages.

Elective Courses Open to Freshmen

Chemistry, 6 (see schedule of freshman year); Entomology, 4, 5, 22, 23; Dairy Industry, 1, 2, 3, 4, 6; Drawing, 1, 2; Farm Mechanics, 3, 4, 20; Farm Practice, 3; Horticulture, 32; Meteorology, 1; Rural Economy, 1; Rural Art, 1, 2; Nature-Study, 1, 2, 4.

Unless otherwise noted, all courses are given in the buildings of the College of Agriculture. Courses inclosed in brackets will not be given in 1911–1912.

AGRICULTURAL CHEMISTRY

Instruction is given in Morse Hall

85. **Agricultural Chemistry.** Second term. Four hours. Prerequisite Chemistry 1. Lectures, T Th S, 11. Lecture Room 1. One recitation, M, W, or F, 8 or 9. Professor CAVANAUGH and Messrs. HEDGES, CROSS, and RICE.

A general course treating of the relations of chemistry to agriculture and dealing with the composition and chemical properties of plants, soils, fertilizers, feeding stuffs, insecticides, and fungicides.

85a. **Agricultural Chemistry.** Either term. Two hours. Prerequisite Chemistry 1 and 6; required of those who have had 1 and 6 and are taking 85. Laboratory course, T Th, 2–4.30, or W F, 8–10.30. Professor CAVANAUGH and Messrs. HEDGES and RICE. Laboratory deposit, part returnable, $15.00.

86. **Agricultural Chemistry.** First term. Two hours. Advanced course, open to those who are taking or have completed Chemistry 87 or 88. Lectures, T Th, 9. Lecture Room 4. Professor CAVANAUGH.

87. **Agricultural Analysis.** First term. Three hours. Prerequisite Chemistry 1, 6, and 85a. Laboratory, T Th, 2–5, and S, 9–12. Professor CAVANAUGH and Mr. CROSS.

Fertilizers, soils, and insecticides. Laboratory deposit, part returnable, $20.00.

88. **Agricultural Analysis.** Second term. Three hours. Prerequisite course 87 and 89 or their equivalent. Laboratory, T Th, 2–5, and S, 9–12. Professor CAVANAUGH and Mr. CROSS.

Feeding stuffs and dairy products. Laboratory deposit, part returnable, $20.00

[89. **Dairy Chemistry.** First term. Two hours. Open to those who are taking or have completed course 87 or 88. Lectures, T Th, 9. Lecture Room 4. Professor CAVANAUGH.] Not given in 1911–12.

90. **Advanced Agricultural Analysis.** Credit and hours by arrangement and appointment. Professor CAVANAUGH.

This course is designed to meet the needs of those engaged in research in agricultural chemistry. Laboratory deposit, $10.00 for one hour of credit; $5.00 more for each additional hour of credit.

91. **Elementary Agricultural Chemistry.** First term. No university credit. Open only to special students. Lectures, M W F, 8. Lecture Room 2. Professor CAVANAUGH and Messrs. CROSS and HEDGES.

ANIMAL HUSBANDRY

1. **Animal Husbandry.** Throughout the year. Four hours a term. Prerequisite course 3; courses 1 and 3 may be taken at the same time. Lectures, M W F, 9. If more than one hundred and fifty students register for this course, the lectures will be repeated on the same days at 8 o'clock. Practice, M, T, W, Th, or F, 2–3.30, by appointment. Animal Husbandry Building. Professor WING and Assistant Professors HARPER and SAVAGE.

The principles of breeding, including the history, development, creation, and improvement of the various races and breeds of farm animals; the principles of feeding, care, selection, and management of dairy and beef cattle, sheep, and swine.

2. **Meat and Milk Production.** Second term. Three hours. Prerequisite first term of course 1. Lectures, T Th, 11. Library work as assigned. Animal Husbandry Building. Professor WING and Assistant Professor HARPER.

A study of practical methods of milk, beef, mutton, and pork production, especially as based on the results of experiment.

3. **Practice in Feeding and Stable Management.** Throughout the year. One hour a term. Required of all students taking course 1. Practice, daily including Sunday, 4 to 6 p. m. For the credit of one hour, daily attendance for three weeks in groups as assigned will be required. Barns and Stables. Professor WING and assistants.

5. **The Horse.** First term. Four hours. Prerequisite first term of course 1. Lectures, M W F, 11. Practice, T, 10–12. Animal Husbandry Building. Assistant Professor HARPER.

History, characteristics of breeds, selection, judging, feeding, care, training, and development of the horse.

6. **Mechanics of the Horse.** Second term. Three hours. Prerequisite course 5. Lectures and recitations, W F, 11. Practice, M, 10–12. Animal Husbandry Building. Assistant Professor HARPER.

Lectures on animal mechanics, animal proportions, and the relation of the latter to specific uses. Practice in measuring animals and testing the value of given measurements for given purposes.

10. **Advanced Stock Judging.** Throughout the year. One hour a term. Prerequisite course 1. Practice, S, 10.30–12.30. Animal Husbandry Building. Professor WING and Assistant Professors HARPER and SAVAGE.

Practice in scoring animals, including critical descriptions of animal form.

12. **Advanced Course in the Principles of Breeding Animals.** Throughout the year. One to three hours a term. Prerequisite course 1. Lectures, F, 11. Animal Husbandry Building. Professor WING and Assistant Professor HARPER.

Lectures, conferences, and reports, including statistical methods as applied to breeding animals. The work of the first term will consist in large part of practice in making reports on statistical problems. The work of the second term will be in large part individual and will afford opportunity for intimate and close study of the various breeds of improved stock.

14. **Advanced Course in the Principles of Feeding.** First term. Two hours. Unless elected by at least five students will not be given. Prerequisite course 1. Lectures and reports, T Th, 9. Animal Husbandry Building. Professor WING and Assistant Professor SAVAGE.

20. **Animal Husbandry.** Second term. Three hours. Special course for students in the New York State Veterinary College; not open to students in the College of Agriculture. Lectures, T Th S, 9. Practice, W, 11–1. Animal Husbandry Building. Professor WING and Assistant Professors HARPER and SAVAGE.

The principles of breeding and feeding animals, with the history of improved breeds. Practicums in compounding rations and in stock judging.

Excursions and Inspection Trips. The following excursions and inspection trips are scheduled for the year 1911–12: to the International Live Stock Show at Chicago, immediately after Thanksgiving Day; to breeders and herds in the vicinity of Syracuse, immediately preceding the spring vacation; to the stock yards and slaughter houses in Buffalo and to breeders in the vicinity, sometime in May. These excursions are elective.

DAIRY INDUSTRY

1. **Milk Composition and Tests.** Either term. Two hours. First term, lectures, T, 11. Dairy Building 222. Practice, T, 2–4.30, or S, 8–10.30. Dairy Building 232. Second term, lectures, T, 11. Dairy Building 222. Practice, Th, 8–10.30, or 2–4.30. Dairy Building 232. Assistant Professor Ross and Mr. ———.

The topics considered are secretion and composition of milk, samples, lactometer, Babcock fat test, acid tests, moisture test, salt test, preservative tests. Laboratory deposit, part returnable, $3.00.

2. **Butter Making.** First term. Three hours. Must be preceded or accompanied by course 1; should be preceded or accompanied by courses 4 and 8; for regular students only. Lectures, F, 11. Dairy Building 222. Practice in one five-hour period each week, T, 1–6, F, 1–6, or S, 8—1. Dairy Building. Mr. GUTHRIE and Mr. ———.

This course considers the principles and practice of butter making in farm dairies and creameries, cream separation, pasteurization, starters, cream ripening, churning, marketing, judging, etc. Laboratory deposit, part returnable, $2.00.

3. **Cheese Making.** First term. Three hours. Must be preceded or accompanied by course 1; should be preceded or accompanied by courses 8 or 17. Lectures and text book, Th, 11. Dairy Building 222. Practice, by appointment. Each exercise will require four to six hours, but the total hours will not exceed the equivalent of two periods or five hours per week. Cheese Laboratory. Mr. FISK.

In this course are considered the principles and practices of cheddar-cheese making, apparatus and buildings, factory bookkeeping. Laboratory deposit, part returnable, $2.50.

4. **Elementary Bacteriology.** First term. Three hours. For regular students only. Lectures will be given in connection with the laboratory practice. First term, M W F, 2–4.30. Second term, M, 10–1, W F, 8–11. Dairy Building 122. Professor STOCKING, Mr. COOK, and Miss WING.

The purpose of this course is to familiarize the student with laboratory methods, preparation of culture media, sterilization, methods of studying bacteria, and morphology and cultural characteristics of bacteria. Laboratory deposit, part returnable, $3.00.

Dairy Mechanics. See Farm Mechanics 4.

6. **Market Milk and Milk Inspection.** Second term. Two hours. Must be preceded or accompanied by course 1; should be preceded or accompanied by courses 4 and 8, or course 17. Lectures, W, 12. Dairy Building 222. Practice, S, 8–10.30, or 10.30–1. Dairy Building. Professor STOCKING and Assistant Professor ROSS.

Attention is given to the production and control of market milk, with special reference to its improvement; milk as food; shipping stations; transportation and sale; pasteurizing; standardizing; certified milk; milk laws; duties of milk inspectors; apparatus and buildings. The practice includes also visits to dairies in the vicinity of Ithaca. A two-day inspection trip in the neighboring counties may be arranged. Laboratory deposit, part returnable, $3.00.

7. **Advanced Testing Laboratory Course.** Second term. Two hours. Prerequisite course 1; not open to first and second year students except by special permission. Practice, T Th, in February, 3.30–5.45; after March 1st, 2–4.30. Dairy Building 232. Assistant Professor ROSS and Mr. ———.

This course includes work in such subjects as the determination of moisture and dry matter in dairy products, commercial tests for casein, various tests for butter fat, commercial tests for butter and oleomargarine, preservatives and adulterations, milk modification. Laboratory deposit, part returnable, $2.00.

8. **Dairy Bacteriology.** Second term. Four hours. Must be preceded or accompanied by course 1, and preceded by course 4 or its equivalent; open to regular students only. Lectures, Th, 11. Dairy Building 222. Practice, M W F, 2–4.30. Dairy Building 122. Professor STOCKING and Mr. COOK.

This course deals with the sources of milk bacteria and methods of controlling their growth, bacteriological studies of market milk and other dairy products, different species of dairy bacteria, making of starters, effect of straining, separation, pasteurization and temperature, bacteriological methods of city milk inspection. Laboratory deposit, part returnable, $4.00.

9. **Advanced Butter-Making.** Second term. Two hours. Must be preceded by a good record in course 2. Practice, one long period each week by appointment; the periods will begin at the opening of the creamery in the morning and will close at 12 o'clock; practice will not begin until after the close of the Winter Course. Dairy Building. Mr. GUTHRIE.

The practice will consist of practical work in the creamery, where 600 to 1000 pounds of butter are made daily. The work will include receiving and ripening cream, starter culture, manufacture of butter, testing for moisture and salt, and judging. Outside reading will be required.

10. **Fancy Cheese and Ice Cream Making.** Second term. Two hours. Must be preceded by courses 1 and 3. Practice, by appointment; each exercise

will require two to six hours, and the total hours will be the equivalent of five hours per week. Dairy Building. Professor STOCKING, Mr. COOK, and Mr. FISK.

The manufacture of certain brands of fancy cheese is given attention.

11. **Dairy Buildings and Equipment, and Business Methods.** Second term. One hour. Must be preceded by course 1, and any two of the following courses: 2, 3, 6, Farm Mechanics 4. Lectures, M, 11. Problems will be assigned to be worked outside of the lecture hour. Dairy Building 222. Professor STOCKING, Assistant Professor ROSS, and Messrs. AYRES, GUTHRIE, and FISK.

This course will include location, plans, and construction of buildings suitable for creameries, cheese factories, and market milk plants; water supply and sewage disposal; equipment for special lines of dairy work; records; business management, including buying and selling of dairy products.

12. **Seminary.** Either term. One hour. This course is for advanced students and is required of graduate students taking work in the Department of Dairy Industry. T, 12. Dairy Building. Professor STOCKING, Assistant Professor ROSS, Mr. GUTHRIE, Mr. FISK, and Mr. COOK.

13. **Research.** Either term. One or two hours by arrangement. For advanced students. Practice, by appointment. Dairy Building. Professor STOCKING, Assistant Professor ROSS, and Mr. GUTHRIE.

Special problems in any line of dairy work can be taken up in this course according to the needs of the student. Facilities are provided for investigational work.

14. **General Agricultural Bacteriology.** First term. Three hours. This course is open to regular and special students who desire a general knowledge of bacteria in relation to agricultural problems, but who cannot spend time for the more thorough courses. Lectures, F, 10. Dairy Building 222. Practice, T Th, 2–4.30. Dairy Building 122. Professor STOCKING, Mr. COOK, and Miss WING.

The characteristics of bacteria, and the place of bacteria in nature; fermentations; bacteria in air, water, and sewage; the manure heap; soil bacteria; nitrogen fixation; relation of bacteria to the dairy and its products; the preservation of farm products, including fruits, vegetables, vinegar, silage, etc. Laboratory deposit, part returnable, $3.00.

15. **Bacteriology for the Home.** Second term. Four hours. This course is intended for students in Home Economics. Lectures, M, 12. Dairy Building 222. Practice, T Th, 2–5, and S, 8–11. Dairy Building 122. Professor STOCKING and Miss WING.

This course considers the nature of bacteria and methods of studying them; the relation of bacteria to air and water, milk, and other foods; canning and preserving; molds and yeasts in their relation to household problems; decay of fruits; house sanitation. Laboratory deposit, part returnable, $4.00.

16. **Milk Composition and Tests.** Either term. Two hours. Similar to course 1; for special students only. First term, lectures, W, 11. Dairy Building 222. Practice, M, 2–4.30, or W, 8–10.30. Dairy Building 232. Second term, lectures, F, 12. Dairy Building 222. Practice, W, 8–10.30. or F, 2–4.30. Dairy Building 232. Assistant Professor ROSS and Mr. ———. Laboratory deposit, part returnable, $3.00.

17. **Dairy Bacteriology.** First term. Three hours. Must be preceded or accompanied by course 1; for special students only. Lectures, W, 10. Dairy

Building 222. Practice, M F, 10–1. Dairy Building 122. Professor STOCKING, Mr. COOK, and Miss WING.

Methods of studying bacteria, preparation of culture media, relation of bacteria to milk and other dairy products. Laboratory deposit, part returnable, $3.00.

18. **Butter Making.** Second term. Three hours. Must be preceded or accompanied by course 1; should be preceded or accompanied by course 17 also; for special students only. Lecture, F, 11. Dairy Building 222. Practice in one five-hour period each week, T, 1–6, F, 1–6, or S, 8–1. Dairy Building. Mr. GUTHRIE and Mr. ———. Laboratory deposit, part returnable, $2.00.

19. **Advanced Cheddar-Cheese Making.** Second term. Two hours. Prerequisite a good record in course 3. Lectures and outside reading in connection with laboratory work. Practice, by appointment, in one long period; each exercise will begin at 10 o'clock and close when the work is done; practice will not begin until close of Winter Courses. Cheese Laboratory. Mr. FISK.

This course considers some of the commercial and scientific problems of cheddar-cheese making. Laboratory deposit, part returnable, $2.00.

All lockers and apparatus loaned to students must be returned and checked up not later than the last day of instruction. If not accounted for at that time they will be checked up by the department and an extra fee of twenty-five cents charged the student.

DRAWING

1. **Mechanical Drawing.** Either term. Two or three hours. Practice, M W, 2–4.30; third hour, if desired, by appointment. Dairy Building 371. Assistant Professor BAKER.

An elementary course to enable the student to make and read simple working drawings, plans, elevations, etc.

2. **Freehand Drawing.** Throughout the year. Two or more hours a term. Lectures during practice, T Th F S, 9–1. Dairy Building 371. Assistant Professor BAKER.

An elementary course for the development of graphic expression applicable to scientific studies. Of especial value to those who expect to enter teaching, nature study, or biological research.

3. **Applied Drawing.** Either term or throughout the year. Two or more hours a term. Prerequisite course 2 or its equivalent. Lectures during practice. Practice by appointment. Dairy Building 371. Assistant Professor BAKER.

Personal instruction in problems of scientific drawing in pencil, pen and ink, wash, and water color.

7. **Freehand Sketching.** Throughout the year. Two hours a term. Prerequisite course 2. By appointment. Dairy Building 371. Assistant Professor BAKER.

Sketching and rendering in various media of indoor and outdoor subjects particularly pertaining to landscape design.

NOTE—No credit is given for drawing as art study, but students desiring to engage in such study are encouraged to do so and may receive instruction in any medium.

Advanced students and graduates engaged in thesis or research work requiring a considerable amount of drawing are encouraged to do such drawing in this department; or, if this cannot be done conveniently, to bring in their work for occasional criticism and suggestion.

ENTOMOLOGY, BIOLOGY, AND NATURE STUDY

Biology

1. **General Biology.** Throughout the year. Three hours a term. Lectures, T Th, 10. Auditorium. Practice, M, T, W, Th, or F, 2–4.30; F, 8–10.30; S, 8–10.30, or 10.30–1. Main 302. Assistant Professor NEEDHAM and assistants.

This is an elementary course designed to acquaint the general student with the main ideas of biology through selected practical studies of the phenomena on which biological principles are based. Both lectures and laboratory work will deal with such topics as: the interdependence of organisms, the simpler organisms, organization and phylogeny, oogenesis and ontogeny, heredity and variation, natural selection and adaptation, segregation and mutation, the life cycle, metamorphosis and regeneration, and the responsive life of organisms. Laboratory fee, $2.50 a term.

Entomology

[1. **Invertebrate Zoology.**] Not given in 1911–12. See course 1 in Vertebrate Zoology.

3. **General Entomology.** Throughout the year. Three hours a term. Prerequisite Biology 1 or Zoology 1. Lectures, W F, 9. Main 392. First term, Professor COMSTOCK; second term, Assistant Professor HERRICK. Practical exercises, Th or F, 2–4.30; first term, Professor COMSTOCK and Miss STRYKE; second term, Assistant Professor HERRICK.

First term, lectures on the characteristics of orders, suborders, and the more important families, and on the habits of representative species. The practical exercises include a study of the structure of insects and practice in their classification. The lectures only (credit two hours) are taken by those who have had courses 4 and 5.

Second term, lectures on the more important insect pests and on methods of controlling them. The practical exercises will include a study of the different stages of as many of the forms as time will permit, together with observations in the field on the habits of the pests. Laboratory fee, $3.00 a term.

4. **Elementary Morphology of Insects.** Either term. Three hours. Laboratory open daily, except S, 8–5. Main 391. Assistant Professor RILEY and Mr. THOMPSON.

An introductory laboratory course required of all students who plan to do advanced work in the Department of Entomology. Laboratory fee, $2.00.

5. **Elementary Systematic Entomology.** Either term. Two hours. Prerequisite course 4. Laboratory open daily, except S, 8–5. Main 301. Assistant Professor BRADLEY.

A study of the wing venation of insects and the identification of specimens belonging to the more important orders and families. With course 4, required of all students who plan to do advanced work in the Department of Entomology. Laboratory fee, $2.00.

6. **Advanced Systematic Entomology.** Either term. Three hours. Prerequisite course 5. Laboratory work, by appointment. Main 301. Assistant Professor BRADLEY.

A training course in the identification and interpretation of obscure characteristics used in the classification of insects. Laboratory fee, $6.00.

7. **Histology of Insects.** Either term. Three or more hours. Prerequisites courses 3, 4, 5, and 12. Laboratory open daily, except S, 8–5. Main 391. Assistant Professor RILEY.

A laboratory course to accompany or follow the first term of course 12. Laboratory fee, $1.50 an hour.

9. **Advanced Economic Entomology and Insectary Methods.** Second term. Two hours. Open only to graduates and to undergraduates who have had courses 3, 4, and 5. Seminary, field and laboratory work, by appointment. Insectary. Assistant Professor HERRICK.

Economic problems connected with applied entomology, discussed, reported upon, and field observations made. Experimental methods in breeding, photographing, investigating, and controlling insects discussed and studied. Designed for advanced students in entomology who desire to fit themselves for experiment station work. Laboratory fee, $2.50.

10. **Classification of the Coccidae.** Second term. Five hours. Prerequisite courses 4 and 5. Laboratory work, by appointment. Main 301. Assistant Professor BRADLEY.

Designed to familiarize the student with the more injurious species of scale insects, the methods of preparing specimens for study, and the systematic arrangement of the species. Laboratory fee, $5.50.

[11. **Morphology and Classification of the Arachnida.** Throughout the year. Three or more hours a term. Open only to graduates. Laboratory work, by appointment. Professor COMSTOCK and Miss STRYKE.] Not given in 1911-12.

12. **Morphology and Development of Insects.** Throughout the year. Two hours a term. Prerequisite courses 3, 4, and 5. Lectures, T Th, 10. Laboratory work to accompany or to follow this course is offered under course 7. Main 392. Professor COMSTOCK and Assistant Professor RILEY.

14. **German Entomological Reading.** Throughout the year. One hour a term. Open only to advanced students in entomology or zoology. W, 7–9 p. m. Main 391. Assistant Professor RILEY.

16. **Elementary Economic Entomology.** First term. Two hours. A course designed for special students; not open to regular students. Lectures, T Th, 9. Main 392. Assistant Professor HERRICK.

Discussion of insect pests in general, with remedial suggestions. Occasionally, the class will be taken to the field to observe insect pests at work. Laboratory fee, $.50.

17. **Literature of Systematic Entomology.** First term. Two hours. Prerequisite course 5. Th F, 8. Main 392. Assistant Professor BRADLEY.

A systematic study of bibliographies, indexes, and general entomological literature; the preparation of catalogues of insects; the evolution of the rules of zoological nomenclature; and the methods of determining the priority of generic and specific names. Laboratory fee, $1.00.

19. **General Limnology.** Second term. Three hours. Open only to students who have taken or are taking Biology 1 and Entomology 3. Lectures, Th, 8. Main 392. Professor NEEDHAM and Mr. LLOYD.

An introduction to the study of the life of inland waters. Aquatic organisms in their qualitative, quantitative, seasonal, and ecological relations. Laboratory fee, $2.50.

20. **Research in Limnology.** Throughout the year. Three or more hours a term. Prerequisite course 19 or the equivalent. Laboratory and field work. Hours by appointment. Main 302 and Biological Field Station. Professor NEEDHAM.

22. **Animal Parasites and Parasitism.** First term. Two hours. Must be preceded or accompanied by Biology 1 or Zoology 1. Lectures, T, 8, Main 392. Practical exercises, sec. 1, M, 2–4.30; sec. 2, T, 2–4.30. Assistant Professor RILEY.

A consideration of the origin and biological significance of parasitism, and of the structure, life history, and economic relations of representative animal parasites. Laboratory fee, $2.00.

23. **The Relations of Insects to Disease.** Second term. Two hours. Prerequisite courses 3 and 22. Lectures, T, 8. Main 392. Practical exercises, T, 2–4.30. Assistant Professor RILEY.

Causation and transmission of disease by insects and other arthropods. Laboratory fee, $2.00.

24. **The Classification of Immature Insects.** First term. Two hours. Prerequisite course 5. Laboratory work, by appointment. Main 301. Assistant Professor BRADLEY.

The taxonomy of nymphs, larvæ, and pupæ. Laboratory fee, $1.00.

27. **Research in Morphology of Insects.** Throughout the year. Three or more hours a term. Prerequisite courses 3, 4, and 5. Laboratory open daily, except S, 8–5; S, 8–1. Main 391. Professor COMSTOCK and Assistant Professor RILEY.

Special work arranged with reference to the needs and attainments of each student. Laboratory fee, $1.50 an hour.

28. **Research in Systematic Entomology.** Throughout the year. Three or more hours a term. Prerequisite courses 3, 4, 5, and 6. Laboratory open daily, except S, 8–5; S, 8–1. Main 301. Professor COMSTOCK and Assistant Professor BRADLEY.

Special work arranged with reference to the needs and attainments of each student. Laboratory fee, $.50 an hour.

29. **Research in Economic Entomology.** Throughout the year. Three or more hours a term. Prerequisite courses 3, 4, and 5. Laboratory and field work, by appointment. Insectary. Professor COMSTOCK and Assistant Professor HERRICK.

In most cases it is impracticable to complete an investigation in this subject during the college year. Students must arrange to conduct their observations during the growing season.

30. **Aquiculture.** Second term. Two hours. Lectures at hours to be arranged. Insectary and Biological Field Station. Dr. EMBODY.

A course on the utilization of the resources of our inland waters.

Seminary. Throughout the year. M, 4.30–5.30. Main 392.

The work of an entomological seminary is conducted by the Jugatae, an entomological club which meets for the discussion of current literature and of the results of investigations. Attendance at the meetings may be counted as laboratory work.

EXTENSION TEACHING

1. **Extension Work.** First term. Two hours. Open to juniors and seniors, to others by arrangement. Lectures and practice, M F, 12, or T Th, 12. Auditorium. Criticism by appointment. Professor TUCK and Mr. WHEELER.

Lectures and discussions on problems of university extension in agriculture. Practice in oral and written presentation of topics in agriculture, with criticism and individual appointments on the technique of public speech. Designed to acquaint students with parliamentary practice, to encourage interest in public affairs, and to train for effective self-expression in public. A few juniors and seniors will be sent out into the state to address meetings.

2. **Extension Work.** Second term. Two hours, or three hours by arrangement. Prerequisite, course 1, of which course 2 is a continuation. Lectures and practice, M F, 12, or T Th, 12. Auditorium. Criticism by appointment. Professor TUCK and Mr. WHEELER.

Special training will be given to competitors for The Eastman Prize for Public Speaking (see page 17).

FARM MANAGEMENT

1. **Farm Management.** Throughout the year. Three hours a term. As many as possible of the following courses should precede or accompany this course: Farm Crops 1, Animal Husbandry 1, Farm Mechanics 3, Pomology 1, Poultry Husbandry 1, Dairy Industry 1, Farm Practice; students who have had or who are taking Farm Crops and Animal Husbandry and who have passed the Farm Practice examination will be admitted; certain other combinations will be accepted after conference; it is recommended that this course be taken in the junior year. Lectures, T Th, 10. Dairy 222. Laboratory, Th or F, 2–4.30, or S, 8–10.30. On days when farms are visited, the laboratory work will not close at 4.30 and 10.30. Agronomy 202. Professor WARREN, Assistant Professor LIVERMORE, and Mr. THOMPSON.

Lectures, recitations, and laboratory practice on farm accounting, farming as a business, regions and types of farming, forms of tenure, selection and purchase of a farm, capital and its distribution, the farm layout and building arrangement, cropping systems, the management of manure and fertilizers, the efficient use of labor and machinery and horses, marketing of farm products, studies of the management of successful farms, preparation of plans for the organization and management of specific farms. Two one-day excursions will be held about May 10th and 20th to farms at some distance from Ithaca. Laboratory fee, $1.00.

2. **Regions and Systems of Farming.** Just before opening of fall term. One hour. Prerequisite course 1. Professor WARREN and Assistant Professor LIVERMORE.

The work in this course will be done just before the opening of the fall term. The class will travel in New York, Pennsylvania, and New Jersey, for about eight days. Students may join the class at points most convenient for them. It is recommended that they arrange to visit regions with which they are not familiar. Only those who satisfactorily complete five days of work will receive credit. The days will be spent in studying the methods of farm management on successful farms, and the evenings in discussions and writing of reports. A full written report will be required. The expenses will average about $5 a day.

3. **Advanced Farm Management.** First term. Two hours. Prerequisite permission to register and course 1. T, 2–5. Agronomy 192. Assistant Professor LIVERMORE.

A further study of farm management, including lectures, problems, reading, and trips to successful farms. Expenses for the excursions are estimated to cost about $5.

4. **Research.** Either term or throughout the year. Two or more hours a term. Prerequisite permission to register; course 3, and must be accompanied by course 5; the number of students will be limited. Professor WARREN, Assistant Professor LIVERMORE, and Mr. THOMPSON.

Investigation of special problems in farm management.

5. **Seminary.** Throughout the year. One hour a term. Open to graduate students and a limited number of undergraduates who are taking courses 3 or 4. Hours to be arranged. Professor WARREN, Assistant Professor LIVERMORE, and Mr. THOMPSON.

FARM MECHANICS

3. **Farm Mechanics.** Either term. Three hours. Students are urged to take Drawing 1 in preparation for this course. First term, lectures, M W, 8. Main 292. Practice, M, T, or W, 2–4.30. Agronomy 31. Second term, lectures, T Th, 12. Dairy 222. Practice, M, T, or W, 2–4.30. Agronomy 31. Assistant Professor H. W. RILEY and Messrs. ROBB, WESTERVELT, BURDICK, and KEPHART.

A study of the principles of operation, the details of construction, and the practical operation and care of: A—Machinery, including gasoline engines, water wheels, devices for transmitting power, farm lighting systems, hydraulic rams, pumps, spray nozzles, spraying outfits, water-supply outfits, plain soldering, and simple pipe fitting for water. B—Implements for tillage, seeding, and harvesting, with a discussion of the special mechanical features of some implements now on the market. Laboratory fee, $2.00.

4. **Dairy Mechanics.** Second term. One hour. Prerequisite course 3. Lectures, F, 8. Agronomy 152. Assistant Professor H. W. RILEY.

A brief lecture course on the principles of operation, installation, and care of steam boilers, steam engines, and piping for steam.

S4. **Forge Work.** Either term. One or more hours. Practice, daily except S, 8–11, 11–2, 2–5, as assigned by Mr. A. E. WELLS. East Sibley. Mr. W. L. HEAD.

A course given in Sibley College especially for agricultural students, covering the construction of the forge, selection of coal, care of the fire, practice in forging

to shape and size, welding iron and steel, and tempering steel. By paying for material used, the student will have opportunity as far as time permits to make for himself a set of tongs, punches, chisels, and other tools. A laboratory fee will be charged.

19. **Research in Farm Mechanics.** Either term. One or more hours. Prerequisite permission to register, and course 3 or its equivalent, together with natural ability in mechanical practice. Assistant Professor H. W. RILEY.

Special work in farm mechanics on problems under investigation by the department or of special interest to the student, provided, in the latter case, the department can furnish adequate facilities.

20. **Farm Engineering.** Either term. Three hours. Prerequisite plane geometry; students are urged to take Drawing 1 in preparation for this course. First term, lectures, T Th, 12. Agronomy 152. Practice, T or W, 2–4.30, in the field. Second term, lectures, M W, 8. Main 292. Practice, M, T, or W, 2–4.30, in the field. Assistant Professor H. W. RILEY and Messrs. ROBB, AUSTIN, and STEVE.

A study of the practical solution of the problems involved in connection with surveying and mapping the farm; locating, digging, and laying drains; laying out building foundations; farm water supply and sewage disposal; road construction and maintenance, with a discussion of the New York State Highway Law. From data obtained in the field a drainage map will be drawn for one of the fields near the college. Laboratory fee, $1.00.

28. **Advanced Work in Farm Engineering.** Either term. One or more hours. Prerequisite permission to register, and course 20 or its equivalent. Practice, by appointment. Assistant Professor H. W. RILEY and Mr. ROBB.

A course intended to provide opportunity for students to conduct special problems on their home farms, or on selected farms in connection with advanced problems in other departments, provided the farm is so situated that the work can be properly supervised.

FARM PRACTICE AND FARM CROPS

Farm Practice

1. **Farm Practice.** Either term. No University credit. Hour and place by appointment. Professor STONE and Mr. ———.

An elective course designed to assist students in meeting the requirements of farm practice demanded by the College.

[2. **Farm Structures.** First term. Two hours. Intended for special students. Lectures and quizzes, T Th, 8. Agronomy 152.] Not given in 1911–12.

A study of building materials used on the farm (including concrete), the principles of construction for barns, stables, and other farm buildings, and their application in practice. A discussion of homemade farm appliances and fences is included. Lectures will be supplemented by assigned reading. A set of working drawings of specified subjects will be required of each student.

[3. **Farm Structures.** Second term. Two hours. Prerequisite Drawing 1 or its equivalent. Lectures and quizzes, T Th, 8. Agronomy 152.] Not given in 1911–12.

Similar to course 2, but intended for more advanced and prepared students.

Farm Crops

1. **Cereals, Forage Crops, Potatoes, and Miscellaneous Crops.** Throughout the year. Four hours a term. Prerequisite Soils 1 or 2. Lectures, M W F, 10. Animal Husbandry 112. Laboratory, M, T, or W, 2–4.30. Agronomy 202. Professor STONE and Mr.———.

Lectures, recitations, and laboratory practice on the history, production, and marketing of cereals, potatoes, field beans, forage crops, and miscellaneous crops. Laboratory fee, part returnable, $2.00 a term.

[4. **Advanced Farm Crops.** Second term. Two hours. Prerequisite course 1; open to a limited number of students. Hours to be arranged. Agronomy 202.] Not given in 1911–12.

A further study of farm crops, including lectures and laboratory practice.

5. **Research.** Either term or throughout the year. Two or more hours a term. Prerequisite permission to register; course 1, and must be accompanied by course 6; the number of students will be limited. By appointment. Professor STONE and Mr.———.

Investigation of special farm crops subjects. Also a study of current experiment station literature.

6. **Seminary.** Throughout the year. One hour a term. Required of all students engaged in research in farm crops; a limited number of students who are taking course 4 may be admitted; not open to others. Th, 2–4.30. Agronomy 192. Professor STONE and Mr.———.

FORESTRY

1. **Farm Forestry.** Second term. Two hours. Open to regular and special students. Lecture, T, 8. Animal Husbandry, 112. Practice, T, 2–5. Agronomy 152. Whenever the weather is unsuitable for outdoor work, the practice will be replaced by a lecture or recitation, T, 2–3. Professor MULFORD.

The management of the farm woodlot, and the starting of new woodlots by planting or sowing. A course dealing with the woodlot as deserving and repaying proper care such as is given the other crops on the farm.

2. **Silviculture.** Throughout the year. Three hours a term. Prerequisite all freshman and sophomore work or its equivalent. Lectures, M W, 8. Main 232. Practice, W, 2–5. Main 191. Whenever the weather is unsuitable for outdoor work, the practice will be replaced by seminary discussions. Professor MULFORD.

Designed for students who wish a more detailed course dealing with the raising of timber. Students who are preparing for the management of large properties and those who are studying rural art are advised to take this course rather than course 1 if possible. Students electing course 2 are advised that it would not be worth while for them to take course 1.

The topics will include: forest description; the life history of the tree and of the forest; the influence of soil, climate, and other factors on the forest; the influence exerted by the forest on climate, soil, and stream flow; forest planting and sowing and forest nursery work; natural reproduction of the forest (i. e. reproducing the forest without planting or sowing); care of the crop during its growth, including thinning; protection from fire and other enemies.

HOME ECONOMICS

A four-year course in home economics is planned for students desiring to specialize in this work. The first two years of the course follow the work as outlined for all students in the College of Agriculture, with the addition of some courses not required in the regular schedule. The last two years permit specialization in some one or more of the branches included under the term home economics. As the course develops, new subjects will be incorporated. All students who register in this department must report to the department at the beginning of the freshman year.

1. **Survey Course in Home Economics.** Throughout the year. Four hours a term. May be taken in any year. Lectures, M W F, 9. Agronomy 192. Practice, M, 2–5. Main 492. Miss ROSE, Miss VAN RENSSELAER, and Mrs. YOUNG.

A non-professional course intended for students registered in any department in the University who desire a general knowledge of some of the subjects grouped under the term home economics. The lectures will include a discussion of foods, food preparation, human nutrition, household sanitation, household management, and house planning. Laboratory fee, $5.00 a term.

2. **Field of Home Economics.** Throughout the year. One hour a term. The course is open only to freshmen in home economics. M, 11. First term, Main 292; second term, Main, 392. Miss ROSE and Miss VAN RENSSELAER.

A course to establish in the mind of the student the relation of home economics to the sciences and arts; its significance in home making, professional life, and technical lines of activity.

3. **Foods.** Throughout the year. Four hours a term. Prerequisite Biology 1, Chemistry 1 and 6. This course should be taken in the sophomore year. Lectures, T Th, 10. First term, Main 232; second term, Agronomy, 152. Practice, W F, 2–5. Miss ROSE.

A course for establishing a fundamental knowledge of foods. The lectures will include a discussion of the composition and characteristics of food stuffs; principles of selecting foods and methods of preparing them, food preservation and adulteration, comparative nutritive and economic values of various food combinations. Laboratory practice will be given to apply scientific principles to food preparation. Laboratory fee, $5.00 a term.

4. **House Sanitation.** Second term. Three hours. Dairy Industry 14 and Physics 1 must precede or accompany this course. Lectures, T Th S, 12. Agronomy 192. Miss VAN RENSSELAER and Assistant Professor H. W. RILEY.

The lectures in this course will include consideration of the sanitary conditions of the house and site; conditions for health and care of sick; the relation of bacteriology to the household in cleaning, in the preservation of foods, in disease, and in disinfection.

5. **Institutional Management.** Second term. One or more hours. Prerequisite Home Economics 3, 4, 6, 14. This course should be taken in the senior year. Lectures and laboratory; hours by arrangement. Main 403. Miss ARNOLD and others.

This course is for students in home economics who wish to choose a field, outside of teaching, in caring for and feeding large numbers. The laboratory will be Sage College, a cafeteria, a tea room, etc.

6. **Human Nutrition.** Throughout the year. Four hours a term. Prerequisite course 3, Physics 1, Human Physiology 3; Chemistry 32 must precede or accompany this course. Should be taken in the junior year. Lectures, T Th, 12. Main 405. Practice, first term, W F, 9–12; second term, W F, 10–1. Main 492. Miss ROSE.

A course for the development of a working knowledge of human nutrition. A study of methods of investigating dietary problems and of the practical means of applying scientific principles in planning family and institution dietaries; consideration of special problems of nutrition, as in infant feeding and feeding in cases of abnormal metabolism. Laboratory work will include, as far as possible, practice in planning and preparing dietaries. An excursion of three or four days to visit schools and various industries will occur at the close of the Spring vacation; estimated expense, ten to twelve dollars. Laboratory fee, $7.50 a term.

9. **House Planning.** First term. Three hours. Not open to students below the junior year. Lectures, T Th, 11. Main 392. Practice, M, 2–4.30. Main 405. Mrs. YOUNG.

An elementary course for developing economic house plans in accordance with architectural principles. Besides the drawing of plans, the course will include discussions of the building site, building materials, elements of construction, laying out the grounds, and criticisms of interior design. Laboratory fee, $2.00.

10. **Household Art.** Second term. Three hours. Not open to students below the junior year. Lectures, T Th, 11. Main 232. Practice, M, 2–4.30. Main 405. Mrs. YOUNG.

A course for the development of artistic expression in the individual. The lectures in this course will apply principles of color and design to questions of interior decorating and furnishing. Students will experiment with color combinations for decorative schemes, and with textile combinations for curtain stuffs, wearing apparel, etc. Laboratory fee, $2.00.

12. **Woman and the Family.** Second term. Three hours. Intended for seniors. Lectures, M T Th, 9. Main 232. Miss VAN RENSSELAER.

This course embraces a study of woman and the family through the early ages to the present time. It treats survivals with reference to various characteristics and conditions of woman in the family and the state. Woman's work and her industrial and economic condition from the beginning are studied with reference to present conditions and their effect on society.

14. **Household Management.** First term. Three hours. Prerequisite Political Science 51; Home Economics 3 must precede or accompany this course. Intended for seniors. Lectures, M T Th, 10. Agronomy 152. Miss VAN RENSSELAER.

This course will include a study of the family income, cost of living, household accounts, problems of domestic service, methods of housekeeping, equipment, marketing; housekeeping for large numbers.

20. **Special Problems.** Throughout the year. Credit and hours by arrangement. Prerequisite a fundamental knowledge of home economics. Open to seniors or graduate students in home economics, or to other qualified persons by special arrangement. Main 403. Miss VAN RENSSELAER, Miss ROSE, and Mrs. YOUNG.

A course intended for the development of the individual student in particular lines of work. Special facilities will be arranged for those intending to teach home economics, which will include a consideration of the logical methods of organizing and developing courses of study in home economics. Problems of original investigation will be planned for graduate students, or for undergraduate students who have proved themselves capable of undertaking such work.

22. **Seminary.** Throughout the year. One hour a term. Required of students in home economics and open only to them. By arrangement. Main 403. Miss ROSE, Miss VAN RENSSELAER, and Mrs. YOUNG.

HORTICULTURE

Floriculture

15. **Commercial Floriculture.** First term. Three hours. Prerequisite Botany 1 and 2, or equivalent; students are advised to take greenhouse construction before entering this course. Lectures, W F, 9. Main 232. Practice, W or F, 2–4.30. New Greenhouses. Assistant Professor BEAL and Mr. COSH.

The culture, diseases, botany, and history of florists' plants, and methods of greenhouse management. Practice in the greenhouses. Those desiring more work in the greenhouse can arrange for one or two additional periods, with credit. Laboratory fee, $1.50.

16. **Florists' Plants and Garden Flowers.** Second term. Three hours. Prerequisite Botany 1 and 2, or equivalent. Lectures, W F, 9. Main 232. Practice, W or Th, 2–4.30. New Greenhouses. Assistant Professor BEAL and Mr. COSH.

A continuation of Floriculture 15, with outdoor gardening in the spring. Laboratory fee, $2.00.

19. **Greenhouse Construction.** First term. Two hours. Prerequisite Drawing 1. Lectures, M, 12. Main 292. Practice, Th, 2–4.30. Main 201. Assistant Professor BEAL.

The development of the modern greenhouse; types of houses, materials, and methods of construction, installation of heating systems, etc. Laboratory practice in erecting section of cypress and iron frame houses, and in planning and estimating the cost of commercial ranges. The class will participate in a required excursion to Elmira on December 9. Laboratory fee, $2.00.

21. **Investigation in Floriculture.** Throughout the year. One, two, or three hours a term. Prerequisite Floriculture 15 and 16; permission to register. Designed primarily for upper classmen and graduate students. Consultations, by appointment. Assistant Professor BEAL.

The investigation of problems in the growing of cut flowers, exotics, and garden flowers; hybridizing; study of varieties.

22. **Greenhouse and Garden Practice.** Throughout the year. One to three hours a term by appointment. Designed for those who desire to enlarge their knowledge of greenhouse and garden plants and their culture. Professor CRAIG and Mr. COSH.

Olericulture

25. **Elementary Vegetable Growing.** Second term. Three hours. Open to those who have taken or are taking Soils 1. Lectures, T Th, 12. Main 292. Laboratory, T, 2–4.30. New Greenhouses. Mr. WORK and Mr. ———.

The principles of vegetable growing as applied in commercial and home production. Important vegetable crops—their adaptation, culture, special requirements, varieties, enemies, marketing, and profits. The laboratory work includes exercises in management and planning, the growing of early plants under glass, and the planting and care of early outdoor vegetables. Each student assumes charge of his own plantings, carrying them through to the end of the term. Laboratory fee, $1.50.

26. **Vegetable Forcing.** First term. Three hours. Prerequisite Soils 1; after 1911–12, Olericulture 25 will be a prerequisite. Lectures, T Th, 12. Main 292. Laboratory, T, 2–4.30. New Greenhouses. Mr. WORK and Mr. ———.

Vegetable growing under glass. Important forcing crops. Laboratory will consist of practical work in crop production. Each student will be assigned a plot in the greenhouse on which he will grow vegetables to maturity, assuming full charge except in heating and ventilation. This will be supplemented by descriptive studies. Laboratory fee, $1.50.

27. **Systematic Olericulture.** First term. Two hours. Prerequisite course 25; not given in 1911–12, unless five persons register. Lecture, W, 12. Main 292. Laboratory hours to be arranged. Mr. WORK.

Lectures and descriptive studies dealing with vegetable crops, their origin and botany. Special attention will be given to varieties, and their adaptation to different cultural and market conditions. The important commercial types of the different vegetables are grown in the garden each year and there is an abundance of first-hand material for the course. Laboratory fee, $2.00.

28. **Advanced Olericulture.** Either term. Two or three hours, by appointment. Prerequisite course 25 and 26. Main 292. Mr. WORK.

The student's time will be divided between advanced systematic and cultural studies of vegetable crops, and the study of a special problem to be agreed upon. An excursion to two or three important vegetable-growing centers will constitute a part of this course, the cost being eight to ten dollars; date to be announced later. Work and exercises in the planning and management of greenhouse establishments.

Advanced and Special Courses

32. **Elementary Horticulture.** Throughout the year. Two hours a term. Must be preceded or accompanied by Botany 1. Lectures, M, 12. Main 232. Practice, M, 2–4.30. Greenhouse and by appointment. Professor CRAIG, Mr. FROST, and Mr. HUNN.

This course aims to emphasize principles and practices involved in the cultivation of garden plants grown for pleasure or profit. It includes the propagation, botany, culture, and economic uses of plants. Some attention is also given to garden making. Designed for teachers of nature study or of elementary agriculture. Laboratory fee, $1.50.

33. **Nuciculture.** Second term. Two hours. Prerequisite training in systematic botany. Lectures, M W, 11. Main 201. Professor CRAIG.

Lectures on the practical and systematic phases of nut culture, with special reference to the cultivation and improvement of the forms native to the United States. The Morris collection of edible nuts of the world in the Department of Horticulture furnishes abundant material for illustrating the lectures. The Robert T. Morris prize of twenty-five dollars for proficiency in propagating nut trees is offered in this course.

34. **Subtropical Pomology.** First term. Three hours. Prerequisite Botany 1 and 2. Lectures, T Th, 11. Main 232. Laboratory, T, 2–4.30. Main 201. Professor CRAIG and Mr. FROST.

A study of citrus and other tropical fruits, with special reference to American conditions. Copiously illustrated. Laboratory work in describing and judging the various fruits. Laboratory fee, $3.50.

35. **Literature of Horticulture and Landscape Gardening.** First term. Three hours. Open to juniors and seniors, and required of graduates. Lectures, M W F, 11. Main 232. Professor CRAIG.

A comprehensive survey of the writings of European and American authors, with special reference to the evolution of horticultural methods.

36. **Evolution of Plants.** Second term. Three hours. Open to juniors and seniors, and required of graduates. Lectures, M W F, 11. Main 232. Professor CRAIG.

Historical development of theories of evolution; recent theories, including a careful examination of present-day methods. Practice in the greenhouse in the technique of plant breeding.

37. **Investigation.** Either term. One or more hours. For advanced students and graduates. Consultations, by appointment. Professor CRAIG.

The student is assigned a subject which, as far as possible, combines original research with bibliographical methods.

38. **Seminary.** Throughout the year. One hour a term. Required of advanced students who elect Horticulture 37 and of all graduate students. Th, 4.35–5.45 p. m. Main 201. Professor CRAIG and members of instructing staff.

METEOROLOGY

1. **Meteorology and Climatology.** Second term. Three hours. Lectures, M W F, 10. Dairy Building 222. Professor WILFORD M. WILSON.

Lectures and weather observations. Designed to acquaint the student with the general circulation of the atmosphere; development, movement, and conditions that attend cyclones, tornadoes, and special storms; practical weather forecasting from weather maps and local observations; the use of meteorological instruments; general and special climatology and its relation to agriculture.

PLANT BREEDING

1. **General Plant Breeding.** First term. Three hours. Primarily for students who are planning to pursue practical farming and who do not wish to take a more comprehensive course. Lectures, T Th, 10. Main 292. Practice, F, 2–4.30 or ———. Second floor new greenhouses. Professor GILBERT and Mr. ———.

A study of the elements of plant breeding, including variation, selection, and hybridization. The laboratory exercises are designed to give practice in measuring variation, making hybrids, and planning plant-breeding schemes adaptable to farm practice. Laboratory fee, $3.00.

2. **Plant Breeding.** First term. Three hours. Prerequisite Botany 1 and 2, or their equivalent. Primarily for juniors and seniors and required of graduate students. Lectures, M W, 12. Agronomy 152. Practice, M, 2–4.30. Second floor new greenhouses. Professor GILBERT and Mr. ———. Special lectures will be given by members of the experimental staff.

This course will undertake a careful consideration of the principles and practice of plant breeding with reference to variation, selection, and hybridization as factors in the amelioration of cultivated plants. Special consideration will be given to the methods and results of present-day plant breeders. Laboratory fee, $3.00.

3. **Plant Breeding.** Second term. Three hours. Lectures and recitations, M W F, 8. Agronomy 192. Professor GILBERT and Mr. ———.

A continuation of course 2. Laboratory fee, $2.00.

4. **Biometry.** First term. One hour. Primarily for graduate students; required of graduate students taking major in plant breeding. Lectures and practice, by appointment. Professor LOVE.

A discussion of statistical methods as applied to problems in biology and practical breeding. The course is designed primarily to develop methods which may be used by graduate students in conducting their investigations.

5. **Research.** Throughout the year. Two hours a term. Prerequisite course 2 or its equivalent. Primarily for senior thesis work. By appointment. Agronomy 311. Professor GILBERT.

This course affords the student an opportunity to study a plant breeding problem which will give him practice in bibliographical and research methods. Laboratory fee, $3.00 a term.

6. **Research.** Throughout the year. Special work for a few advanced graduate students, arranged with reference to individual aims and attainments. By appointment. Agronomy 311. Professors WEBBER, LOVE, and GILBERT.

Problems in plant breeding, heredity, and general evolution.

7. **General Seminary.** Throughout the year. One hour a term. Required of all graduate students in plant breeding except candidates for the doctor's degree who are taking their major in plant breeding; also required of seniors taking course 5. Th, 2–4. Agronomy 152. Professor GILBERT, assisted by Professors WEBBER and LOVE.

A seminary for the discussion of the fundamental problems of plant breeding, heredity, and general evolution, of methods of plant breeding, and of plant breeding literature.

8. **Advanced Seminary.** Throughout the year. Open only to graduate students who are registered for the doctor's degree and who have major investigation in plant breeding. Time and place to be announced. Professors WEBBER, LOVE, and GILBERT.

A seminary for the discussion of the fundamental problems of variation, heredity, and evolution.

PLANT PATHOLOGY

1. **Plant Pathology.** First term. Three hours. Prerequisite Botany 1 and 2, or their equivalent. Lecture, F, 12. Agronomy 152. Practice, W F, 2–4.30, or Th, 2–4.30 and S, 10.30–1. Agronomy 302. Professor WHETZEL and Miss JENKINS.

A fundamental course treating of the common diseases of cultivated plants, their nature, cause, and control. A prerequisite for all other courses in plant pathology. The practice sections must be taken in the couplets announced above. Laboratory fee, $4.50.

2. **Principles of the Control of Plant Diseases.** Second term. Three hours. Prerequisite course 1. Lecture, F, 12. Agronomy 152. Practice, W F, 2–4.30, or Th, 2–4.30 and S, 10.30–1. Agronomy 302. Professor REDDICK and Miss JENKINS. Professor GILBERT and Assistant Professor H. W. RILEY will assist in this course.

A consideration of methods for the control of plant diseases, including sanitation, seed treatment, seed selection, spraying, tree surgery, immunization, preservation of timber, etc. Laboratory fee, $4.50.

3. **Laboratory Methods in Plant Pathology.** Throughout the year. One hour a term. Prerequisite course 1. Required of all students taking advanced work. Lecture, M, 12. Agronomy 302. Professor WHETZEL and Professor REDDICK.

4. **Etiology of Plant Diseases.** Throughout the year. Four hours a term. Prerequisite course 1. Lectures, W Th, 12. Agronomy 302. Practice, M T, 2–4.30. Agronomy 302. Professor WHETZEL and Mr. FITZPATRICK.

Designed especially for students who wish to specialize in plant pathology. The taxonomy and phylogeny of organisms producing diseases in plants. Laboratory fee, $4.50 a term.

[5. **Diseases of Field and Truck Crops.** First term. Three hours. Prerequisite course 1. Conference, T, 12. Agronomy 302. Practice by appointment, M T W, 8–12. Professor WHETZEL.] Not given in 1911–12.

6. **Diseases of Fruit and Fruit Trees.** Second term. Three hours. Prerequisite course 1. Conference, T, 12. Agronomy 302. Practice by appointment, M T W, 8–12. Agronomy 302. Professor REDDICK and Mr. ———.

Designed especially for students who expect to become practical fruit growers. Laboratory fee, $4.50.

[7. **Diseases of Forcing-house and Florist's Crops.** First term. Three hours. Prerequisite course 1. Conference, T, 12. Agronomy 302. Practice by appointment, M T W 8–12. Professor WHETZEL.] Not given in 1911–12.

Designed especially for students specializing in forcing-house or florticultural work. Laboratory fee, $4.50.

[8. **Dendropathology.** Second term. Three hours. Prerequisite course 1. Conference, F, 12. Agronomy 302. Practice by appointment, Th F, 8–12. Professor WHETZEL and Mr. ———.] Not given in 1911–12.

Designed especially for students in forestry and rural art. Laboratory fee. $4.50.

Advanced and Graduate Courses

14. **Phytopathological Technique.** Throughout the year. Three hours a term. Must be preceded or accompanied by course 3. Professor WHETZEL, Professor REDDICK, Assistant Professor BARRUS, and Messrs. STEWART and JENSEN.

Laboratory practice in the study of the pathogenicity of organisms, isolation, culture work, inoculation, infection, etc. Laboratory fee, $4.50 a term.

15. **Phytopathological Histology.** Throughout the year. Three hours a term. By appointment. Agronomy 326. Professor WHETZEL.

Study of types of histological modifications of plant tissues resulting from disease. Laboratory fee, $4.50 a term.

20. **Research.** Throughout the year. Not less than three hours a term. Professor WHETZEL, Professor REDDICK and Assistant Professor Barrus.

Original investigation of problems in plant pathology. Laboratory fee, $1.50 an hour.

25. **Seminary.** Throughout the year. Required of all graduate students in plant pathology. Hour by arrangement. Agronomy 302. Professor WHETZEL, Professor REDDICK and Assistant Professor BARRUS.

The work of the seminary in plant pathology is conducted by the Plant Doctors, a phytopathologist's club which meets for the discussion of current literature and of research.

PLANT PHYSIOLOGY

3. **Crop Ecology and Geography.** Second term. Two hours. Prerequisite all freshman work; recommended for sophomores or upperclassmen, and for students with some agricultural experience. Lecture, W, 11. Laboratory, S, 10.30–1. Main 392. Professor DUGGAR, Dr. McCOOL, and Mr. HILL.

Lectures, demonstrations, laboratory exercises, and reports, emphasizing the relations of plants to climate; a study of crops and economic plants with respect to environment and distribution.

7. **General Plant Physiology.** First term. Four hours. Prerequisite all freshman work, or its equivalent; this course may be taken to satisfy the requirement in plant physiology. Lectures, M W, 10. Main 292. Laboratory, sect. I, Th, 2–5, S, 11–1; sect. II, M, 2–5, W, 11–1; sect. III (if space permits), T, 2–5, F, 11–1. Agronomy 101. Assistant Profefsor KNUDSON, Dr. McCOOL, and Mr. HILL.

Lectures and laboratory work, supplemented by field studies where possible. The topics include absorption, nutrition, relations to environment, growth reproduction, and propagative processes. Limited as to number in 1911–12 unless additional space is provided. Laboratory fee, $5.00.

8. **Advanced Plant Physiology.** Throughout the year. Four hours a term. Prerequisite training in botany and chemistry; recommended for the junior or senior year. Lectures, T Th, 10. Agronomy 192. Laboratory, W F, 2–4.30. Agronomy 101. Professor DUGGAR, Assistant Professor KNUDSON, and Mr. HILL.

Lectures, laboratory practice, and reports. This is a comprehensive course in normal physiology and requires on the part of the student good fundamental

preparation. It is designed for those specializing in plant study. Laboratory fee, $5.00 a term.

9. **The Physiology of Fermentation.** Second term. Three hours. Prerequisite required work through the sophomore year, bacteriology, and Plant Physiology 7 or 8. Lectures, M, 12. Agronomy 192. Laboratory by appointment. Assistant Professor KNUDSON.

Recommended for graduates and for undergraduates specializing in physiological, bacteriological, or pathological work.

[10. **Physiology of Bacteria.**] Not given in 1911–12.

12. **Cytology.** Throughout the year. Three hours a term. Prerequisite adequate training in botany. Lectures, F, 10. Agronomy 101. Laboratory, T, 2–5, Th or S, 11–1. Agronomy 101. Professor DUGGAR and Mr. ———.

A course for advanced students, giving instruction in the physiology of the cell, and of reproduction and inheritance. Microtechnique and special topics. Laboratory fee, $5.00 a term.

Courses Primarily for Graduates

14. **Special Chapter in Metabolism.** Second term. One hour or more. Offered in 1911–12, if feasible. Lecture, W, 10. Agronomy 152. Laboratory hours by appointment. Agronomy 101. Professor DUGGAR.

A study of some of the more important temporary and storage products of plant metabolism.

16. **General Seminary.** Throughout the year. One hour a term. Limited to advanced students and graduates taking work in the Department. Conference, F, 11. First term, Agronomy 152. Second term, Agronomy 101. Professor DUGGAR.

During the first term, topics will be chosen from current work in plant physiology. During the second term, special outlines will be followed and reports in research presented.

17. **Seminary in Cytology.** Second term. One hour. By appointment. Professor DUGGAR.

18. **Research, General Physiology.** Throughout the year. Credit for major or minor; otherwise not less than four hours a term. Prerequisite adequate training in botany, chemistry, and physiology. By appointment. Agronomy 101. Professor DUGGAR.

19. **Research, Cell Physiology.** Throughout the year. Credit for major or minor, otherwise not less than four hours a term. Prerequisite adequate training in botany and physiology. By appointment. Agronomy 101. Professor DUGGAR.

In courses 18 and 19, problems in plant physiology (including ecology, cytology, and heredity) and the general relation of plant physiology to agriculture will be assigned for investigation. Reports or theses will be required.

POMOLOGY

1. **Elementary Pomology.** First term. Three hours. Lectures, T Th, 11. Main 292. Practice, Th or F, 2–4.30, or S, 8–10.30. Main 202. Professor WILSON and Mr. ANTHONY.

A study of the methods of propagation and early care of commercial fruits; the principles of budding, grafting, pruning, and planting. A part of the work in the study of varieties and the practice of packing apples is included. Laboratory fee, $2.00.

2. **Practical Pomology.** Second term. Three hours. Prerequisite course 1. Lectures, M W, 11. Recitation, M or W, 12, F, 11, or S, 9. Main 292. Professor WILSON.

A study of the soils, varieties, and planting plans for the orchard; cultivation, cover crops, fertilization, spraying, and pruning as practiced in orchard management: the picking, grading, packing, storing, and marketing of fruit. This course considers the apple, pear, quince, cherry, plum, apricot, peach, and the nuts.

4. **Bush Fruits.** Second term. One hour. Prerequisite course 1. Lectures and discussions, T, 10. Main 292. Professor WILSON.

A lecture course which considers the grape, raspberry, blackberry, dewberry currant, gooseberry, and strawberry. The topics discussed are: varieties, planting, culture, picking, grading, packing, and marketing.

6. **Spraying of Fruit Trees.** Second term. Two hours. Prerequisite course 1, Plant Pathology 1, Entomology 8 or 16. Lectures, Th, 10. Main 292. Practice, Th or F, 2–4.30. Main 202. Professor WILSON and Mr. ANTHONY.

A study of the preparation and application of the spray mixtures used in orchard practice. Laboratory fee, $2.00.

8. **Advanced Practical Pomology.** First term. Two hours. Prerequisite courses 1 and 2, and Botany 1 and 2 or Biology 1. Lectures or recitations, W, 11. Main 292. Practice, W, 2–4.30. Main 202. Professor WILSON and Mr. ANTHONY.

The course considers the packing of apples in boxes and barrels; a comprehensive study of the varieties of peaches, plums, grapes, pears, and apples; the judging of fruits. From the students in this course teams will be chosen to do practical judging at the annual meetings of the state societies at Rochester. The preparation of the fruit exhibit at the College is required of the students in this course. Laboratory fee, $2.00.

10. **Systematic Pomology.** Second term. Two hours. Prerequisite courses 1, 2, and 8, and Botany 1 and 2 or Biology 1. Lectures or recitations, Th S, 11. Main 292. After May 1st a laboratory period, S, 10.30–1, is substituted for one lecture. Professor WILSON.

A course designed primarily for graduates and students who are preparing to do experimental work. A study of the characters and botanical relationships of the fruits of the United States. Each student is required to collect and mount a number of varieties and species.

13. **Research in Pomology.** Throughout the year. One or more hours a term. Prerequisite courses 1 and 2; students taking this course are required to take Pomology 14. F, 9. Main 202. Professor WILSON and Mr. ANTHONY.

Original investigation of problems in pomology. A typewritten thesis is required.

14. **Seminary.** Second term. One hour. Open only to graduates and students taking course 10 or 13. F, 9. Main 202. Professor WILSON and Mr. ANTHONY.

POULTRY HUSBANDRY

1. **Poultry Husbandry.** Throughout the year. Three hours a term. Lectures, T Th, 9. First term, Dairy Building 222; second term, Auditorium. Practice, M, T, or W, 2–4.30. Poultry Plant or Poultry Laboratory. Professor RICE, Assistant Professor ROGERS, and Mr. ———.

A general elementary discussion: kinds of poultry farming; principles of poultry house construction; breeds of domestic poultry; principles of poultry breeding; anatomy of poultry; the killing, picking, grading, and packing of poultry; caponizing; poultry diseases and parasites; poultry feeds; feeding for egg production; fattening and rearing; marketing poultry products; judging of dressed poultry and eggs; incubating and brooding. There will be short excursions to poultry farms, Saturday, May 11 and Saturday, May 18 (not required).

2. **Feeding and Management.** Second term, after March 1st. One hour. Must be preceded or accompanied by course 1; preferably also by Animal Husbandry 1. Practice, three short periods a day for four weeks; morning, 8–8.30; noon, 12.45–1.15; and night, 4.30–5. Poultry Plant. Professor RICE and Messrs. KRUM and ———.

The managing and keeping of records of a flock of fowls for egg production and for fattening, including the care and sale of eggs.

3. **Incubator Practice.** Second term, after March 1st. One hour. Must be preceded or accompanied by course 1. Practice, three short periods a day for four weeks: Morning, 8–8.30; noon, 12.45–1.15; and night, 4.30–5. Poultry Plant. Professor RICE and Messrs. ——— and ———.

Practice in operating incubators and in keeping the records, including the taking apart and setting up of machines, etc.

4. **Advanced Judging.** First term. Two hours. Must be preceded or accompanied by course 1. Recitations and practice, Th F, 2–4.30. Poultry Laboratory. Assistant Professor ROGERS and Mr. ———.

The origin, history, and classification of breeds of domestic poultry. Judging the principal breeds for fancy points, by both score-card and comparison methods.

5. **Poultry Farm Management.** Second term. Two hours. Must be preceded or accompanied by courses 1, 2, and 3; should be preceded or accompanied by Farm Management 1. Lectures and recitations, Th, 12. Poultry Laboratory. Practice, Th, 2–4.30. Poultry Laboratory. Professor RICE and Mr. BENJAMIN.

There will be several excursions to representative poultry plants in April and May.

8. **Research.** Either term or throughout the year. One to three hours a term. Prerequisite courses 1, 2, and 3; the course should be accompanied by course 9. By appointment. Dairy Building 101. Professor RICE and Assistant Professor ROGERS.

The conducting of an original investigation of a problem in poultry husbandry, to be presented as a written thesis.

9. **Seminary.** Either term or throughout the year. One to three hours a term. Prerequisite courses 1, 2, and 3; the course should be accompanied by courses 4 and 5; can best be taken in the last year by special students, and in

the senior year by regular students. Recitations and conferences, W, 12. Poultry Laboratory. Professor RICE and Assistant Professor ROGERS.

For advanced study and conference. Includes review of literature, written reports on research, and study of advanced problems.

RURAL ECONOMY

1. **Agriculture.** First term. Two hours. Open only to freshmen. Lectures, T Th, 11. Agronomy 152. Professor LAUMAN.

A brief general survey of agriculture in its technical, economic, social, and historical aspects. Designed to give the beginner a view of the whole field of agriculture.

4. **Rural Economy.** First term. Three hours. Prerequisite Political Science 51. Lectures, M W F, 9. Agronomy 152. Professor LAUMAN.

A study of the general economic problems of agriculture.

5. **Rural Social Conditions.** First term. Three hours. Prerequisite Political Science 51. Lectures, M W F, 11. Main 392. Professor LAUMAN.

A study of the social history, status, and problems of the rural community.

6. **History of Agriculture.** Second term. Three hours. Not open to students below the junior year. Lectures, M W F, 9. Agronomy 152. Professor LAUMAN.

The more important phases of the development of agriculture are considered historically.

7. **Conservation.** Second term. Three hours. Open to juniors and seniors in all colleges. Lectures, M W F, 11. Agronomy 152. Professor LAUMAN.

8. **Cooperation.** Second term. Two hours. Prerequisite Political Science 51. Lectures, T Th, 11. Main 193. Professor LAUMAN.

A study of the general principles and history of cooperation with special reference to agriculture and the conditions prevailing in the United States.

14. **Rural Economy.** Second term. Three hours. Prerequisite course 4. Lectures, T Th, 9. Main 193. Professor LAUMAN.

An advanced course of more detailed and critical study of a few of the general economic problems of agriculture.

18. **Investigation.** Either term or throughout the year. For graduates not candidates for degrees and for advanced seniors by special permission. Credit for undergraduates two or three hours a term. Main 195. Professor LAUMAN.

19. **Seminary.** Throughout the year. One hour a term. By arrangement. For graduates, and open to advanced seniors by special permission. Main 195. Professor LAUMAN.

Devoted to current literature, the study of monographs, and reports on the progress of the investigations by members of the seminary.

RURAL EDUCATION

It is expected that courses in rural education, for the benefit of those who expect to teach, will be offered in 1911–12.

SOIL TECHNOLOGY

1. **Principles of Soil Management.** Second term. Three hours. Prerequisite Chemistry 85 and Geology 1 first term. Lectures, M W, 9. Auditorium. Practice, M T W Th or F 2–4.30. Agronomy 42. Professor FIPPIN and Mr. ———.

An elementary course covering the derivation, classification, function, and properties of soils, and the principles of their management in plant production. Laboratory fee, $2.00.

2. **Principles of Soil Management.** First term. Three hours. Must be preceded or accompanied by Chemistry 91. Designed for special students. Lectures, M W, 9. Auditorium. Practice, M, W, Th or F, 2–4.30. Agronomy 42. Professor FIPPIN and Mr. ———.

Should be taken the first year. Similar to course 1. Laboratory fee, $2.00.

[4. **Soils of the United States.** Second term. Three hours. Prerequisite course 1. For juniors or seniors. Lectures, T Th, 10. Agronomy 152. Excursions, F, 2–4.30. Professor FIPPIN.] Not given in 1911–12.

A discussion of the classification and occurrence of soils in the United States, especially in New York, with particular reference to their distribution, crop relations, agricultural importance, and special features in their management. Designed to give a comprehensive view of the soil resources of the country. Illustrated by maps and slides. Excursions and field trips will cost not more than five dollars.

[5. **Soil Surveying.** First term. Two hours. Prerequisite course 1 or 2; Farm Management 1 is a desirable preparation. For juniors or seniors. Practice, S, 8–1. Field and Agronomy 42. Professor FIPPIN.] Not given in 1911–12.

Preparation of reports and maps on soil conditions; classification and agricultural development of specific areas, with particular reference to farm management. Study of the business development of land. The first half of the term is devoted to field studies, the last half to laboratory studies and the preparation of reports. Laboratory fee, $2.00.

6. **Advanced Soils.** First term. Two hours. Prerequisite course 1. For juniors or seniors. Lectures, T Th, 9. Agronomy 152. Mr. BUCKMAN.

Discussion of the physical, chemical, and biological properties of the soil as they bear on crop production; mechanical analysis; physics of the retention and movement of moisture and air; absorption of heat; chemistry of soil solution; alkali and its amelioration; the biological relations of the soil as they affect fertility.

7. **Manures and Fertilizers.** Second term. One hour. Prerequisite course 1 or 2. Lectures, Th, 11. Agronomy 152. Mr. BUCKMAN.

This course deals with the kinds, quality, composition, deterioration, and economic use of manures; the sources, function, composition, and use of commercial fertilizers; the kinds, use, and efficiency of amendments.

8. **Drainage and Irrigation.** Second term. Two hours. Prerequisite course 1 or 2, and Farm Engineering 20. For juniors and seniors. Lecture, F, 10. Agronomy 152. Practice, T, 2–4.30. Agronomy 42. Professor FIPPIN.

History, economic relations, principles, and practice of drainage and irrigation.

10. **Advanced Laboratory.** Either term. One or more hours. Must be preceded or accompanied by course 6; should be accompanied by course 14. Practice by arrangement. Agronomy 42. Professor FIPPIN and Mr. BUCKMAN.

A series of experiments illustrating the physical and chemical properties of soil in their relation to moisture, fertilization, and plant production. Laboratory fee, $2.00 an hour of credit.

11. **Research in Soils.** Either term. One or more hours. Admission by conference. For graduate students only. Practice by appointment. Agronomy 211. Professor LYON and Assistant Professor BIZZELL.

Three graduate students who are qualified to conduct research in certain phases of soil investigation may register for major subject in the research laboratory. Laboratory fee, $5.00.

14. **Soil Seminary.** Throughout the year. One hour a term. Required of students taking courses 10, 11, or thesis work, and of all graduate students in soils. M, 7.15–8.45 p. m. Agronomy 152. Professors LYON and FIPPIN, and Assistant Professor BIZZELL.

Review of current literature, preparation of special reports, and the discussion of current problems in soil management.

RURAL ART

Not Open to Special Students

This is a four-year course, the first two years of which include the regular work of the College of Agriculture, the last two years special work in rural art and landscape architecture. This course prepares the student better to understand the problems of rural and civic improvement, and, supplemented by one year or more of office training with a reputable landscape architect, fits the student to enter the more professional field of landscape art.

Courses, 1, 2, 3, and 4 are in a sense broadly educational and are open to the general student. Course 1 is particularly for students in the winter courses. Course 6 may be taken by students not specializing in rural art.

Previous to entering upon the more specialized work of this department, beginning in the junior year, the student must have completed the requirements of the freshman and sophomore years and in addition must offer the following: Trigonometry 7b (prerequisite to Elementary Surveying 10, which may be taken in junior year preparatory to Rural Art 9), Elementary Architecture 11, Rural Art 1.

Previous to graduation the student must have completed the following courses in addition to the regular work: Economic Entomology 8, Rural Economy 4, Horticulture 19, Water Color 14.

Graduate work is offered in this department.

On succeeding pages is given a suggested outline of the course in rural art.

First year	First term	Second term
English 1	4	4
Botany 1	3	1
Botany 2	–	2
Chemistry 1	6	–
Chemistry 85	–	4
Biology	3	3
Drawing 2	2	2
Rural Art 2	–	1
	18	17

Second year	First term	Second term
Geology 1	3	3
Physics 1	4	–
Physics 5	2	–
Physics 10	2	–
Physiology of Domestic Animals 21	–	3
Trigonometry 7b	–	2
Elementary Architecture 11	3	3
Shades and Shadows 13	1	–
Water Color 14	–	2
Rural Art 3	1	1
	16	14

Third year	First term	Second term
Rural Art 4	2	1
Rural Art 5	3	3
Rural Art 6	2	2
Rural Art 7	2	2
Entomology 3	3	3
Political Science 51	–	5
Elementary Surveying 10	3	–
	15	16

Fourth year	First term	Second term
Rural Art 8	3	3
Rural Art 9	2	2
Rural Art 10	2	2
Rural Art 11	–	1
Horticulture 19	2	–
Soils 1	–	3
Rural Economy 4	3	–
	12	11

Suggested Additional Electives

	First term	Second term
Plant Pathology 1 and 2	3	3
Horticulture 32	2	2
History of Architecture 10	3	3
Planning of Domestic Buildings 34. 5 lectures, no credit		
Modern Architecture 40	–	2
Pen and Ink Drawing 37	2	–
Life Class 42	2	2
Thesis	2	2

1. **Rural Improvement.** A course of six lectures, beginning after the Christmas recess. No university credit. Open to regular, special, and winter course students. Time to be announced. Professor FLEMING, Assistant Professor DAVIS, Mr. MONTILLON, and staff of visiting lecturers.

This course consists of brief outlines and discussions of the ways and means of bettering out-of-door conditions. It deals with questions of rural improvement, such as will enable the young man or woman from the farm, or others, to get a point of view in rural art in general, together with specific hints for working out some of his home problems.

2. **Lectures Introductory to Work in Rural Art.** Second term. One hour. Intended for freshmen and sophomores. Lectures, T, 12. Assistant Professor DAVIS, Mr. MONTILLON, and occasional lectures by Professor FLEMING and other practicing landscape architects.

3. **History of Landscape Design.** Throughout the year. One hour a term. Required for course 4. Lectures, T, 10. Room to be announced. Professor FLEMING, Assistant Professor DAVIS, and staff of visiting lecturers.

A study of the chronological development of the art of landscape gardening, its modifications in various countries, and the influences which have affected it. A full study of the three types of gardening, ancient, medieval, and modern, and their relation to landscape work of the present day.

4. **Theory and Aesthetics of Rural Art and Landscape Design.** Throughout the year. Two hours. Prerequisite course 3. This course is intended for juniors and seniors; students specializing in rural art must take it in the junior year. Lectures, T, 11, W, 9. Room to be announced. Professor FLEMING, Assistant Professor DAVIS, and staff of visiting lecturers.

A study of the principles of landscape design, and discussions of theory in application to specific problems. Professor FLEMING and Assistant Professor DAVIS will be assisted by representative farm superintendents, nurserymen, park superintendents, gardeners, garden architects, civic advisers, and landscape architects. Subjects to be covered are as follows: Ideals of landscape design; the appreciation of landscape; the personal equation in landscape design; principles, elements, and materials of landscape design; landscape improvement of farms; private properties; country estates; home grounds; gardens; public properties; civic design; park planting; park maintenance.

5. **Landscape Design.** Throughout the year. Three hours a term. Must be preceded by the required work of the freshman and sophomore years. Drafting periods, M W F, 2–4.30. Rural Art Drafting Room. Assistant Professor DAVIS and Mr. MONTILLON, assisted by Professor FLEMING in consultation and criticism.

Work on practical office and local problems in design, finished plans and detailed working drawings, with specifications. The aim is to familiarize the student with the various types of plans and presentations as applied to different problems. A series of competitive sketch, preliminary, and final problems continues throughout the year. These will be judged by a competent committee.

6. **Organography of Plant Materials of Landscape Gardening.** Throughout the year. Two hours a term. Prerequisite Botany 1 and 2. Lectures, Th, 12. Practice, F, 10–12.30. Rooms to be announced. Mr. DOAN, assisted by Professor FLEMING and Assistant Professor DAVIS.

A comprehensive study of the ready identification at all seasons of trees, shrubs, vines, and perennials (native and introduced) which are used by the landscape gardener. This course is not distinctively horticultural, but is designed to familiarize the student in landscape design with the planting material used in general landscape work. Special attention is given to the general characteristics of such material, considered as elements of composition in outdoor art. Laboratory fee, $3,00.

7. **Freehand Sketching.** Throughout the year. Two hours a term. Prerequisite Drawing 2. By arrangement. Dairy Building 341. Assistant Professor BAKER.

Sketching and rendering in various media of indoor and outdoor subjects pertaining particularly to landscape design and its presentation.

8. **Advanced Problems and Research in Landscape Design.** Throughout the year. Three hours a term, and by special arrangement additional hours. Prerequisite course 5. Drafting periods, M W F, 2–4.30. Rural Art Drafting Room. Professor FLEMING, Assistant Professor DAVIS, and Mr. MONTILLON.

The more complicated problems, such as country estates, parkways, and civic centers, are worked out in detail. Studies, reports, plans of arrangement, rendered studies, detailed drawings, grade designs, planting plans, total estimates of cost, and a set of specifications, are worked out for two major problems. Minor problems are required from time to time.

9. **Landscape Engineering and Details of Construction.** Throughout the year. Two hours a term. Prerequisite Elementary Surveying 10. Intended for seniors. Lectures, T, 9. Room to be announced. Practice, F, 10–12.30. Rural Art Drafting Room. Assistant Professor DAVIS, Mr. MONTILLON, and Professor FLEMING in consultation and criticism.

The engineering work peculiarly necessary to landscape gardening will be considered, such as the making of models, relief maps, contour maps, setting of grade stakes, slope stakes, making profiles, sections, and finished grade designs, use of plane table, estimates of cost of construction.

10. **Plant Materials of Landscape Gardening.** Advanced course. Throughout the year. Two hours a term. Prerequisite course 6. Intended for seniors. Lectures, W, 10. Room to be announced. Practice, T, 2–4.30. Assistant Professor DAVIS, and Professor FLEMING in consultation and criticism.

A detailed study of the use, adaptation, arrangement and aesthetic composition of ornamental trees, shrubs, vines, and perennials in all the phases of landscape gardening; planting problems of the landscape architect, park commissioner, and landscape gardener; planting plans, nursery lists, and estimates of cost of planting.

11. **Seminary.** Second term. One hour. Room and hours to be announced. Professor FLEMING and Assistant Professor DAVIS.

This course includes review of current literature, the discussion of important questions relating to various phases of landscape work, and reports on investigations.

Excursions. During or at the end of the second term, a four or five day trip is generally taken for the purpose of studying good examples of landscape work.

1909 and 1911—Albany to New York, Hudson River Section.

1910 and 1912—Vicinity of Philadelphia and Washington.

NORMAL DEPARTMENT—NATURE STUDY

Two-year Special Course in Nature Study

This course is designed to help persons who expect to teach nature study and country-life subjects in the public schools. Persons actually engaged in teaching and all persons in the University who signify their intention to teach are eligible. A certificate will be given on the completion of sixty hours in the courses prescribed below, together with such other work in the College of Agriculture as may be approved by the Secretary.

It should be undertsood that the outlined two-year course does not undertake to furnish the training necessary to fit for teaching positions in the better high schools. Students intending to prepare for such work are advised to complete the regular course leading to a degree, electing the special course of this department.

First year	No. of course	First term	Second term
Botany	1	3	1
Botany	2	–	2
Biology	1	3	3
Entomology	3	3	–
Geology	1	3	3
Chemistry	91	3	–
Nature Study	1	–	2
Horticulture	32	2	2
		—	—
		17	13
Elective, two-thirds agriculture		0–1	2–5

Second year*	No. of course	First term	Second term
Vertebrate Zoology	5	3	3
Botany	5	–	2
Soils	2	3	–
Farm Crops	1	4	4
Nature Study	6	1	1
Nature Study	2	2	2
		—	—
		13	12
Elective, two-thirds agriculture		2–5	3–6

*Additional courses in education may be required during the second year.

1. **Nature Study Pedagogy and Literature.** Second term. Two hours. Lectures, T Th, 12. Goldwin Smith 227. Mrs. COMSTOCK.

Lectures on nature study as a part of primary education and a discussion of methods of correlating nature study with other school work; a review of popular nature literature and its effect on the child.

2. **Nature Study in Field and Laboratory.** Throughout the year. Two hours or more a term. Practice, T Th, 8–10. Insectary. Mrs. COMSTOCK.

This course gives laboratory and field practice with those subjects in plant and animal life which are best fitted for nature study in the elementary schools. Special attention is given to methods of study and manner of presentation, and also to the relating of the topics to agriculture. The work consists of conferences, and field and laboratory practice.

3. **Nature Study. Advanced Course.** Throughout the year. Two hours or more a term. Prerequisite course 2 and Biology 1. Laboratory, M, 2–4.30, W, 9–11, 2.30–5. Insectary and Main 406. Mrs. COMSTOCK.

Field and laboratory work. This course includes the nature study of the garden.

4. **The Nature Study of the Farm.** First term. Two hours. Lectures, T Th, 12. Main 392. Mrs. COMSTOCK.

This course deals, from the standpoint of nature study, with the common birds, animals, insects, trees, plants, and weeds found most commonly on the farm and of special interest to the farmer. Discussion of popular nature literature. This is especially planned for students from the farm and those interested in introducing nature study into the rural schools.

5. **Nature Study Seminary.** First term. One hour. W, 12–1. Main 406. Professor NEEDHAM and Mrs. COMSTOCK.

Informal discussions of the relations of nature-study to life, to science, to agriculture, and to the public schools.

6. **School Gardening.** Throughout the year. One hour a term. Prerequisite Horticulture 32 or its equivalent. Lectures and practice, T, 2. Main 193. Miss MCCLOSKEY and Mr. HUNN.

Lectures on gardening as related to education; management of school gardens; discussions relating to school gardens.

7. **School Gardening.** Throughout the year. One to three hours a term. Prerequisite course 6 and Horticulture 32, or their equivalents. Advanced course. By appointment. Miss MCCLOSKEY and Mr. HUNN.

SPECIAL WORK

Opportunities are provided for persons who desire to pursue special studies. Students must be at least eighteen years of age (after 1911-12, twenty-one years of age) to take advantage of this work, and applications will be received until September 15. No non-resident of the State of New York will be accepted under the age of twenty-three, unless he can meet all requirements for entering upon the regular course.

1. **Special Work in General Agriculture.** This work is designed to meet the needs of young men and young women from the farm who have not time for a four-year course. They must satisfy the College that they are well enough grounded in the secondary school subjects to enable them to pursue the work [illegible] the University, and also that they

desire to take the work because of direct interest in agricultural affairs. They must present an honorable dismissal from the school last attended and certificates of good moral character, and such other certificates and letters as may be desired. This work is not a definite "course" in the sense of having a program or a prescribed set of studies. The student chooses any of the agricultural "electives" that he may be fitted to pursue. Certain courses are to be given by some of the departments for those who lack some of the fundamental work usually required in those subjects. Admission as a special student does not admit to classes. The student is admitted to the various classes by the heads of the departments concerned.

2. **Nature Study Special Course.** This course of two years is open to teachers, or to such students in regular University courses as signify their intention to teach, who desire to prepare themselves in nature study and country-life subjects. The work is largely prescribed. The course comprises two categories of work: the subject-matter studies, and the pedagogical work. The subject-matter is secured in the regular classes of the University, largely in the biological departments. The pedagogical training is to be had in connection with the regular nature-study courses (see page 53).

EXTENSION WORK

The extension work of the College of Agriculture is designed to help persons directly on their farms, and to aid those who desire definite instruction, but who cannot take a long or regular course in agriculture in the University. It supplements the teaching and experimenting of the College of Agriculture. It is professedly a popular work. It endeavors to reach the common problems of the people, to quicken the agricultural occupations, and to inspire a greater interest in country life. It is also a bureau of publicity, whereby there is an exchange of all important matters connected with the progress of the agriculture of the state.

WINTER COURSES

The Winter Courses now offered are five, all opening Nov. 28, 1911, and closing Feb. 23, 1912. They are:

1. General Agriculture.
2. Dairy Industry.
3. Poultry Husbandry.
4. Horticulture.
5. Home Economics.

A special program describing these courses will be sent on application to the Secretary, New York State College of Agriculture, Ithaca, N. Y.

SUMMER COURSES

A Summer School in Agriculture has been established for the benefit of persons who desire to teach agriculture, nature study, and home economics, in the public schools. The courses are open not only to teachers but also to other qualified persons who may wish to avail themselves of the opportunities offered.

Instruction is given in three groups of courses, in any one of which a person may spend all his time. Opportunity is provided for persons taking one of the groups to elect some work in one of the other groups.

1. **Agriculture.** In this group, instruction is offered in soils, agricultural chemistry, farm crops, animal husbandry, dairy industry, poultry husbandry, pomology, farm management, entomology, plant pathology, and meteorology.

2. **Nature Study and Elementary Agriculture.** The subjects included in this group are the history, development, and pedagogics of the nature-study idea; school gardens; field trips; collection, preparation, and preservation of materials; rural education; nature literature; and specific lessons in elementary agriculture and nature study as outlined in the syllabus issued by the New York State Department of Education for 1911–12.

3. **Home Economics.** This group covers the general subjects of foods, human nutrition, principles of household economy, and household sanitation.

The Summer School in Agriculture is distinct from the regular Summer Session in Cornell University. Any of the courses in the regular University Summer Session, however, may be elected by qualified students registered in the Summer School in Agriculture on the payment of prescribed fees.

In 1912, the Summer School will open July 8 and close August 16.

COURSES IN OTHER COLLEGES THAN AGRICULTURE, REQUIRED OF REGULAR STUDENTS

1. **English. Introductory Course.** Throughout the year, credit four hours a term. Students who have not taken the course in the first term may enter in the second term. Open only to underclassmen who have satisfied the entrance requirement in English. Professor STRUNK, Assistant Professors NORTHUP, COOPER, and ADAMS, Drs. MONROE, BAILEY, and PEEK, and Messrs. KIRK, SMITH, BROUGHTON, PRALL, and CARROLL. Seventeen sections, at the following hours: M W F S, 8, 9, 11, 12; M T Th F, 10, 11, 12; T W Th F, 10, 11. Special sections for agricultural students, M W F S, 8, 9, or 12. Rooms to be announced.

A study of representative works in English literature, including three plays of Shakespeare, five modern novels, and selected lyrics and essays. Practice in composition in connection with the reading, with incidental study of the principles of writing. The course is in charge of Professor STRUNK.

1. **Botany. General Comparative Morphology and Physiology of Plants.** First term and until March 25, credit three hours first term; one hour second term. Professor ATKINSON, Dr. MCALLISTER, and Messrs, STONE, HIGGINS, and LEARN. One lecture, M, 10, 11, or 12, and two laboratory periods a week as follows: Sec. 1, M W, 2–4.30; Sec. 2, T, 8–10, 2–5; Sec. 3, Th, 8–10, 2–5; Sec. 4, first term: F, 9–11, S, 9–12; second term: F, 9–12, S, 9–11. Sage College, Botanical Lecture Room.

A study of representative plants of various groups and of the fundamental principles of plant life, relationship, and evolution.

2. **Botany. Special Morphology, Taxonomy, and Ecology of the Higher Plants.** Second term beginning March 27, credit two hours. Prerequisite course 1. Professor ROWLEE, Dr. BROWN, and Messrs. STONE, HIGGINS, and LEARN. One lecture, M, 10, 11, or 12, and two laboratory periods a week as follows: Sec. 1, M W, 2–4.30; Sec. 2, T, 8–10, 2–5; Sec. 3, Th, 8–10, 2–5; Sec. 4, F, 9–12, S, 9–11. Sage College, Botanical Lecture Room.

Studies of typical plants representing the more general groups of angiosperms; field excursions for the purpose of studying the local flora.

1. **Chemistry. Introductory Inorganic Chemistry.** Lectures, recitations, and laboratory. Repeated in second term, credit six hours.

1a. Lectures. First term, M W F, 11, Professor DENNIS and Mr. SUTHERLAND; T Th S, 11, Professor BROWNE and Mr. SUTHERLAND. Second term, M W F, 11. Morse 1.

1b. Recitations (one hour a week to be arranged), and laboratory (two 2½ hour periods a week to be arranged). Professors DENNIS and BROWNE, Mr. WELSH, and Messrs. HOULEHAN, GAUB, NUNEZ, SHERWOOD, CARRUTH, O'BRIEN, and ———.

6. **Chemistry. Qualitative and Quantitative Analysis.** Repeated in second term. credit five hours. Prerequisite course 1. Mr. LEMON, and Messrs. UHLRICH, GIBBONS, YOUNT, BOIES, and ———. Lectures, T Th, 12, Morse L. R. 1. Laboratory sections: M W F, 2–5; T Th S, 8–11; T Th S, 9–12.

Qualitative work: the properties and reactions of the common elements and acids and their detection in various liquid and solid mixtures.

Quantitative work: the preparation and use of volumetric solutions in elementary gravimetric analysis.

1. **Elementary Geology.** Throughout the year, credit three hours a term. Professors TARR, GILL, RIES, and HARRIS, and Messrs. PERRINE, RICH, STORRER, and MCKAY. Lectures, T Th, 9. McGraw, Geological Lecture Room. One laboratory period a week, sections afternoons daily except Saturday, also preferably Friday and Saturday mornings. Two all-day excursions, one by special train to Rochester, and one by boat to Union Springs, are given in the second term, attendance upon which is required of all students in the course.

Planned to give beginners a knowledge of the fundamental principles and facts of geology by means of lectures, maps, lantern slides, specimens, and field study. Students who intend to specialize in geology should take this course not later than their sophomore year.

1. **Physics. Introductory Experimental Physics.** Repeated in second term, credit four hours. Professors NICHOLS and SHEARER and Mr. GIBBS. M T W Th, first term 9 or 12, second term 12. Rockefeller A.

Entrance physics is not accepted as an equivalent of this course.

5. **Physics. Introductory Physics.** Class-room work. Repeated in second term, credit two hours. Messrs. HOWE, FORMAN, RODGERS, AYRES, BUCKLEY, HOWES, and SMITH. M W, 10 or 11, T Th, 10 or 11. Rockefeller, to be assigned.

10. **Physics. Introductory Physical Experiments.** Either term or throughout the year. Credit one to four hours a term; two hours credit required of agricultural students. Assistant Professors BLAKER and RICHTMYER, and Messrs, GIBBS, GALAJIKIAN, MAYER, TAYLOR, BIDWELL, POWER, and ———. Sec. 1, M W, 8–10.30; Sec. 2, M T, 2–4.30; Sec. 3, Th F, 2–4.30; Sec. 4, S, 8–10.30, 10.30–1. Rockefeller 220–232.

12. **Physiology. The Physiology and Sanitation of the Domesticated Animals.** Three hours weekly. Second term. T Th F, 10. Veterinary College. Professor FISH.

3. **Physiology. Elementary Human Physiology.** First term. Credit three hours. Professor SIMPSON and assistants. T Th S, 12. Stimson Hall, Large Amphitheatre.

For students who expect to teach physiology in the secondary schools, and an introductory course for students of the biological sciences. A general review of the functions of the systems and organs of the human body, with introductory remarks on structure. The lectures will be fully illustrated by experiments, lantern slides, and diagrams, and periodical quizzes and examinations will be given.

51. **Political Science. Elementary Economics.** Repeated in second term, credit five hours. Professor WILLCOX, Drs. USHER and SABY, and Messrs. LAGERQUIST, TURNER, and ———. Lectures, M, 11 or 12, Sibley Dome. Recitations, T W Th F, 8, 10, 11, or 12, Goldwin Smith.

A general introduction to economics and a preparation for further studies in any department of political science. One lecture each week and four hours of class-room discussion of text books and assigned questions or supplementary reading. For section assignments and other information apply at Goldwin Smith 260.

OFFICIAL PUBLICATIONS OF CORNELL UNIVERSITY

Issued at Ithaca, N. Y., monthly from July to November inclusive, and semi-monthly from December to June inclusive.

[Entered as second class matter, August 31, 1910, at the post office at Ithaca, N. Y., under the Act of July 16, 1894.]

These publications include the Catalogue Number (containing lists of officers and students), and the Book of Views, for each of which a charge of twenty-five cents a copy is made, and the following informational publications, any one of which will be sent gratis and post-free on request. The date of the last edition of each publication is given after the title.

General Circular of Information for prospective students, August 1, 1911.
Announcement of the College of Arts and Sciences, January 15, 1911.
Courses of Instruction in the College of Arts and Sciences, June 15, 1911.
Announcement of Sibley College of Mechanical Engineering and the Mechanic Arts, Feb. 1, 1911.
Announcement of the College of Civil Engineering, June 1, 1911.
Announcement of the College of Law, May 15, 1911.
Announcement of the College of Architecture, September 1, 1911.
Announcement of the Medical College.
Announcement of the New York State College of Agriculture, October 1, 1911.
Announcement of the Winter Courses in the College of Agriculture, September, 1910.
Announcement of the Summer School in Agriculture, July 1, 1911.
Announcement of the New York State Veterinary College, May 1, 1911.
Announcement of the Graduate School, March 15, 1911.
Announcement of the Summer Session, April 1, 1911.
Annual Reports of the President and the Treasurer, November, 1910.

Pamphlets on scholarships, fellowships, and prizes, samples of entrance and scholarship examination papers, special departmental announcements, etc.

Correspondence concerning the publications of the University should be addressed to

The Registrar of Cornell University,
Ithaca, N. Y.